PB-231 071

COMPUTER PROGRAMS FOR THE CONVERSION OF ILLINOIS STATE AIR QUALITY DATA TO THE SAROAD FORMAT

Paul Swartz, et al

Walden Research Corporation

Prepared for:

Environmental Protection Agency

December 1973

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TECHNICAL REPORT DATA
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1. REPORT NO.	2.	PB 231 071
EPA-450/3-74-019		

4. TITLE AND SUBTITLE	5. REPORT DATE
Computer Programs For The Conversion Of Illinois State Air Quality Data To The Saroad Format	December 1973
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
Paul Swartz, Khee M. Chng, Dr. Richard D. Siegel	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Walden Research Corporation 359 Allston Street Cambridge, Massachusetts 02139	10. PROGRAM ELEMENT NO. 2AE132
	11. CONTRACT/GRANT NO. 68-02-0049
12. SPONSORING AGENCY NAME AND ADDRESS Environmental Protection Agency Research Triangle Park, North Carolina 27711	13. TYPE OF REPORT AND PERIOD COVERED Final
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report describes two computer programs that are used to convert State of Illinois air quality data to the SAROAD format. The first program (the PREPROCESSOR) preprocesses the Illinois data on tape and writes out an output tape for the main program (the CONVERSION). The PREPROCESSOR is written in ASSEMBLY to facilitate the "unpacking" of some of the data records which are in packed decimal format. The CONVERSION is written in FORTRAN IV and does all the necessary conversion to the SAROAD format.

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17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Preprocessor Conversion Program JCL Assembly Routine		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
Release Unlimited	Unclassified	75
	20. SECURITY CLASS *(This page)*	22. PRICE
	Unclassified	# 6.75

EPA Form 2220-1 (9-73)

EPA-450/3-74-019

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by

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Prepared for

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

December 1973

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Publication No. EPA-450/3-74-019

ACKNOWLEDGEMENTS

This work was carried out under the direction of Dr. R. D. Siegel who assumed project responsibility. The principal programming effort was done by P. Swartz, with K. M. Chng consulting.

The Project Officer for this program was Mr. Barry Bolka of the Surveillance and Analysis Division, Region V Office, U.S. Environmental Protection Agency.

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I. INTRODUCTION

This report describes two computer programs that are used to convert State of Illinois air quality data to the SAROAD format [1, 2]. The first program (the PREPROCESSOR) preprocesses the Illinois data on tape and writes out an output tape for the main program (the CONVERSION). The PREPROCESSOR is written in ASSEMBLY to facilitate the "unpacking" of some of the data records which are in packed decimal format. The CONVERSION is written in FORTRAN IV and does all the necessary conversion to the SAROAD format.

The main body of the report is made up of four primary sections as follows:

(1) Program Functions, which describe briefly the scope and structure of the PREPROCESSOR and the CONVERSION programs.

(2) Input Data Description, which contains detailed description of input data format for the two programs.

(3) Sample Case, provided by the Illinois EPA in the form of air quality data on tape, was used to demonstrate the execution of these programs.

(4) Operational Information, consisting of software data and program messages, are discussed in the last section.

Additionally, source listings for both programs, the Job Control Language (JCL) requirements, and the necessary modifications to the CONVERSION program to accommodate site or pollutant additions are included in the Appendices.

II. PROGRAM FUNCTIONS

A. THE PREPROCESSOR PROGRAM

The PREPROCESSOR program reads an Illinois tape, sorts the records by type and writes a tape consisting of four files, one for each record type. In processing each record, it changes blanks to nines because a distinction between blanks and zeros is necessary and FORTRAN (as used in the CONVERSION) cannot make such a distinction. Some of the records contain data in packed decimal format and this is unpacked before writing. The output tape is designed for processing by the CONVERSION program. The PREPROCESSOR will process one input tape and stop. No diagnostics are written.

The basic elements of the PREPROCESSOR are illustrated in the flow diagram in Figure 2-1.

B. THE CONVERSION PROGRAM

The CONVERSION program reads the tape output created by the PREPROCESSOR and by a table look-up method obtains the corresponding SAROAD codes for each record processed. It then writes a four file output tape of eighty column card images in the SAROAD format and stops. The files correspond to the four record types 3, 2, 1 and 5 in that order. Physical record blocking is controlled by appropriate JCL specifications.

An optional feature allows the program to write the output to the same device as it writes the diagnostics (initially set to the line printer). Each line of printed output will be preceded by the corresponding unconverted Illinois record.

The CONVERSION program consists of a MAIN routine plus six subroutines. It has two labelled common blocks which are common to the entire program.

The MAIN routine initializes the IO common block which determines which input/output devices will be utilized by the subroutines. Then MAIN in turn calls into execution four subroutines, each of which handles a file containing a particular record type.

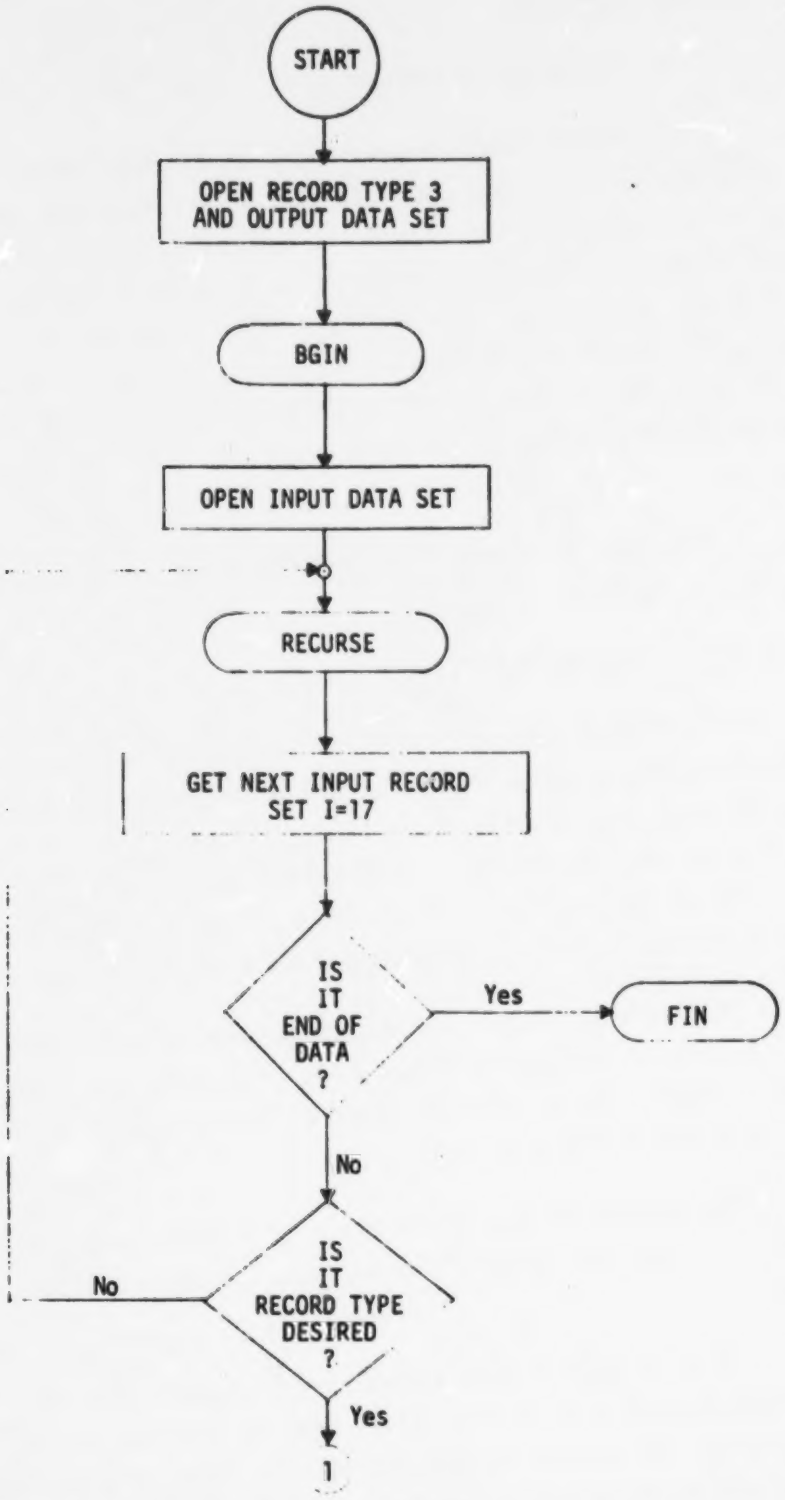


Figure 2-1. Flow Diagram for PREPROCESSOR Program.

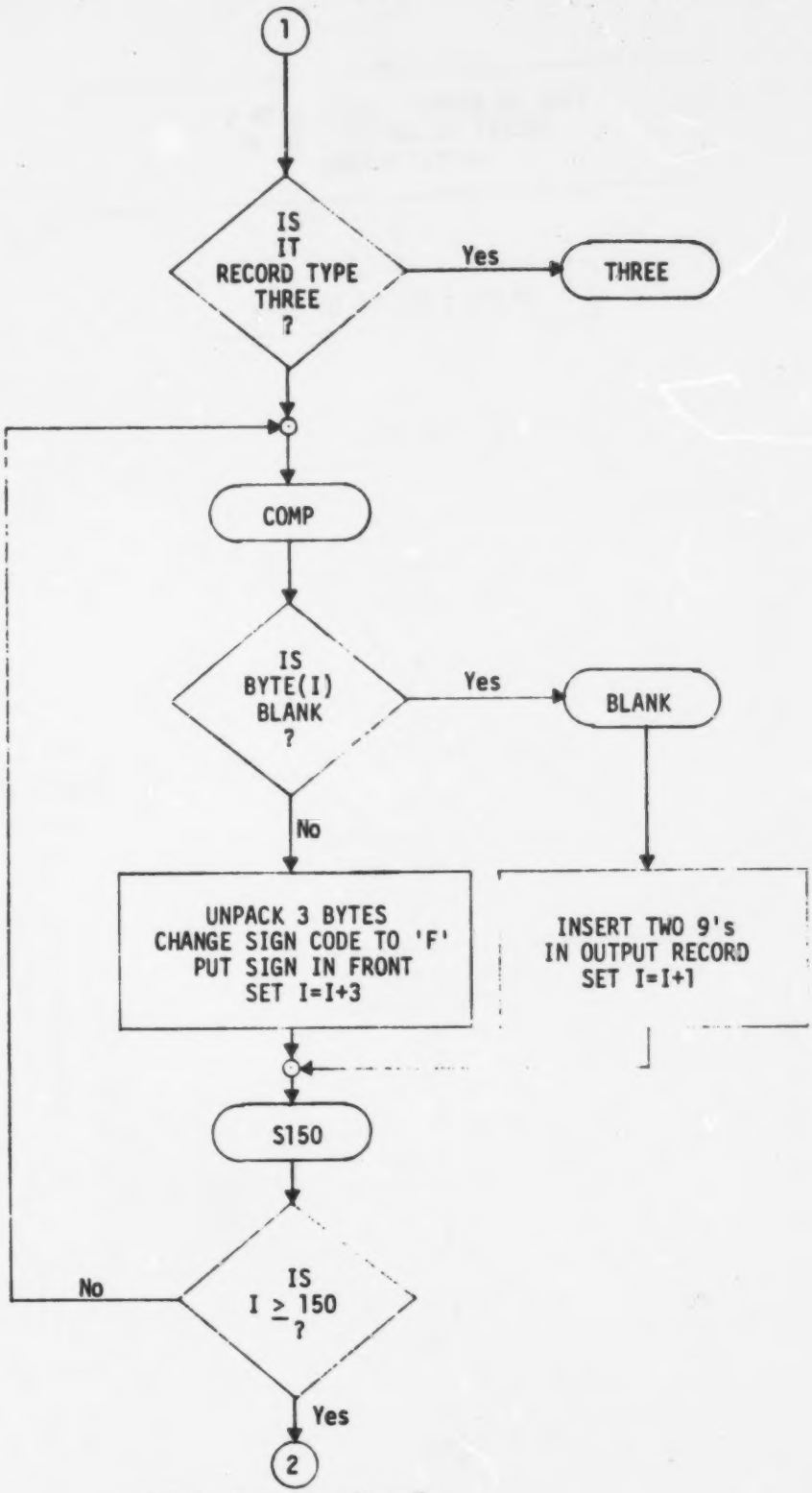


Figure 2-1 (continued)

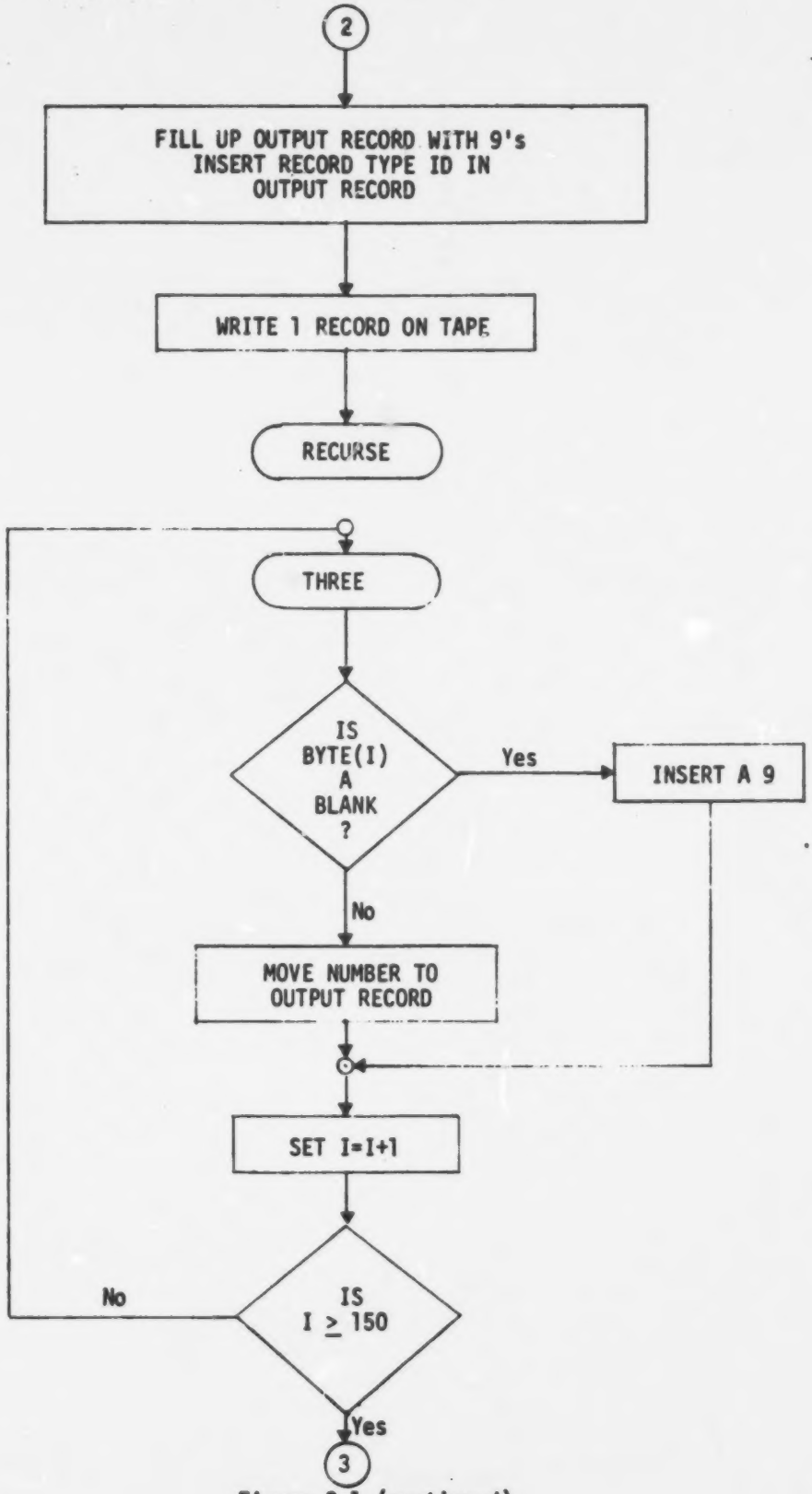


Figure 2-1 (continued)

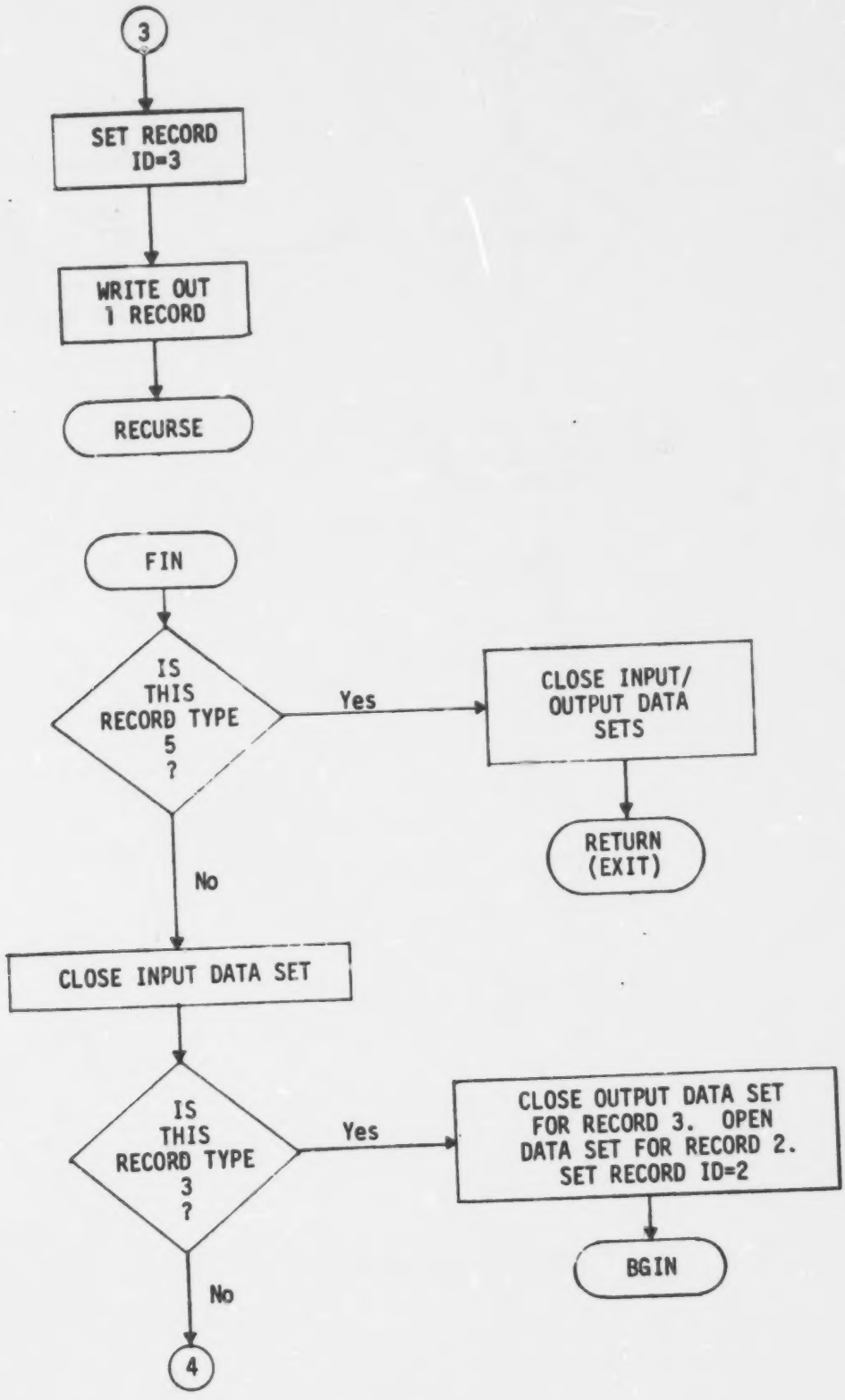


Figure 2-1 (continued)

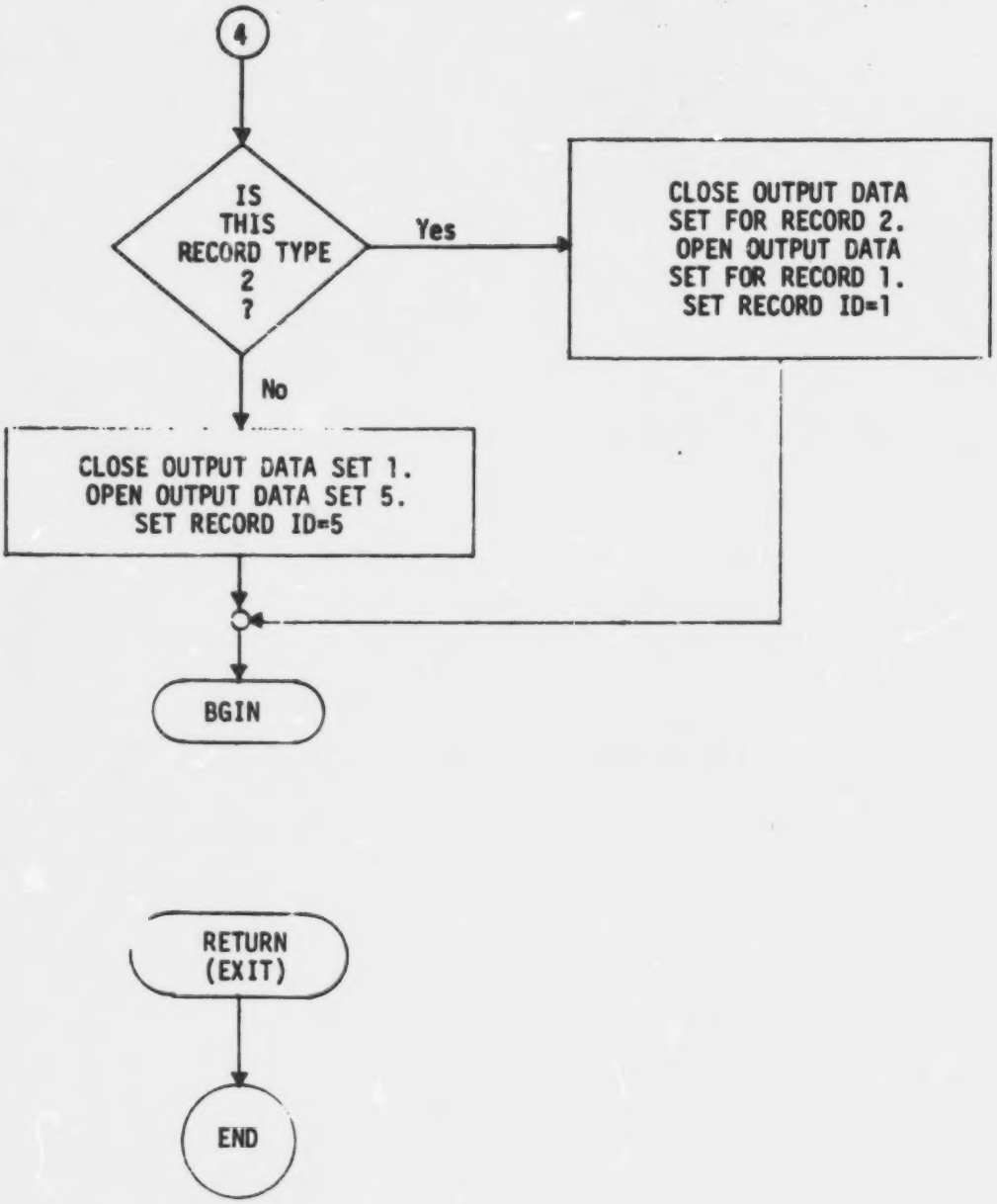

4
IS THIS RECORD TYPE 2 ?
Yes
CLOSE OUTPUT DATA SET FOR RECORD 2. OPEN OUTPUT DATA SET FOR RECORD 1. SET RECORD ID=1
No
CLOSE OUTPUT DATA SET 1. OPEN OUTPUT DATA SET 5. SET RECORD ID=5
BGIN
RETURN (EXIT)
END

Figure 2-1 (continued)

The four subroutines are named mnemonically for the various record types, REC1, REC2, REC3, REC5, and are independent of each other. Their primary functions are similar: they read in an Illinois record of the correct type and write out a new record, converted to SAROAD format. The processing is done in the remaining two subroutines, HEADER and PLUTNT.

The subroutine HEADER searches a table of Illinois geographic and site codes and if it finds a match, it returns a SAROAD state code, area code, site code, and agency/project code. If no match is found, it writes a diagnostic saying so, sets an error flag, and returns to the calling subroutine.

PLUTNT searches a table of pollutant codes to find a match. If it finds one, it goes on to obtain method, units, and decimal place information from another table at a place which is specific to the site and pollutant codes and returns to the calling subroutine. If an error occurs, it writes a diagnostic, sets an error flag and returns.

All of the arguments for the subroutines are passed through the labelled common HEAD except for I/O device numbers which are contained in the labelled common IO.

The sequence of events discussed above are depicted in the flow diagram shown in Figure 2-2.

Figure 2-2. Flow Diagram for CONVERSION Program (Main).

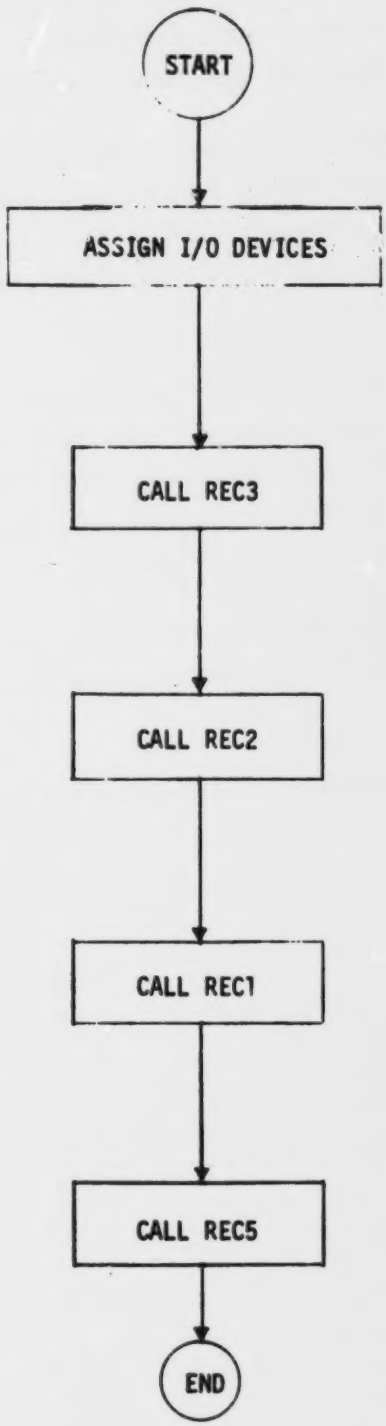


Figure 2-2 (continued) (SUBROUTINE REC3)

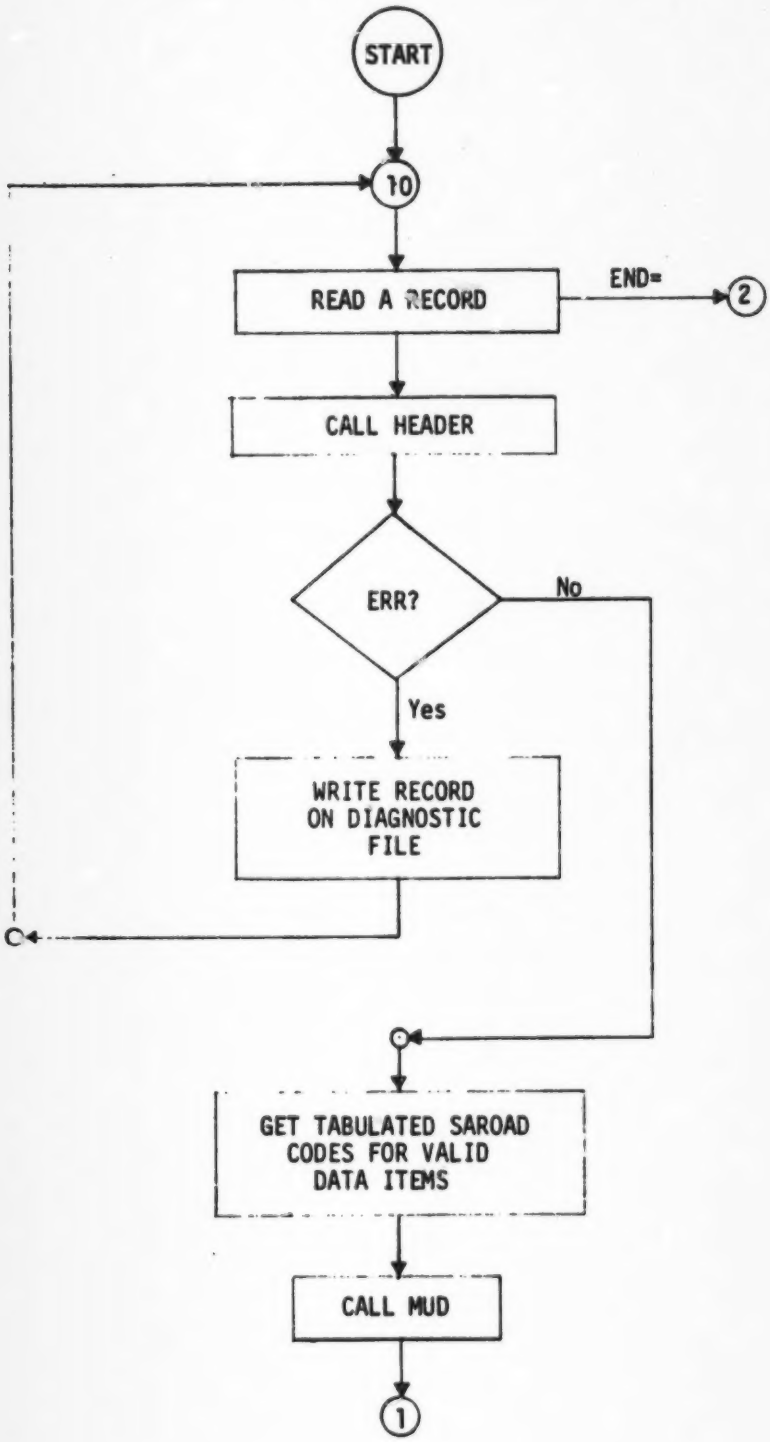


Figure 2-2 (continued) (SUBROUTINE REC3)

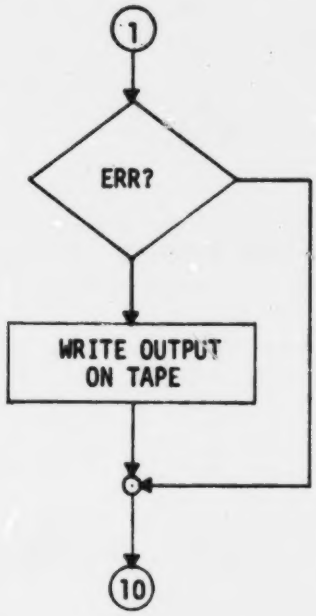


Figure 2-2 (continued) (SUBROUTINE REC2)

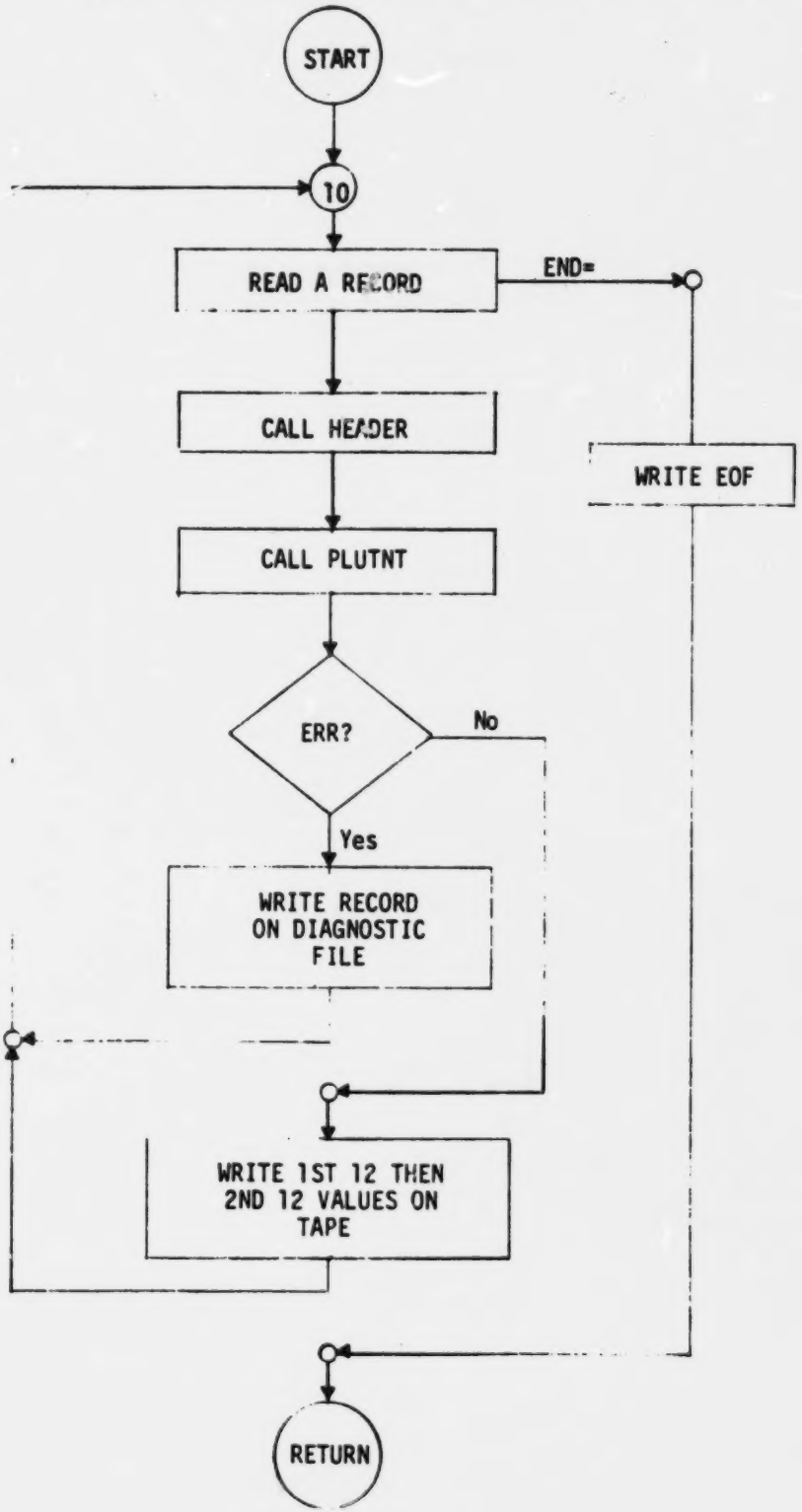


Figure 2-2 (continued) (SUBROUTINE REC1)

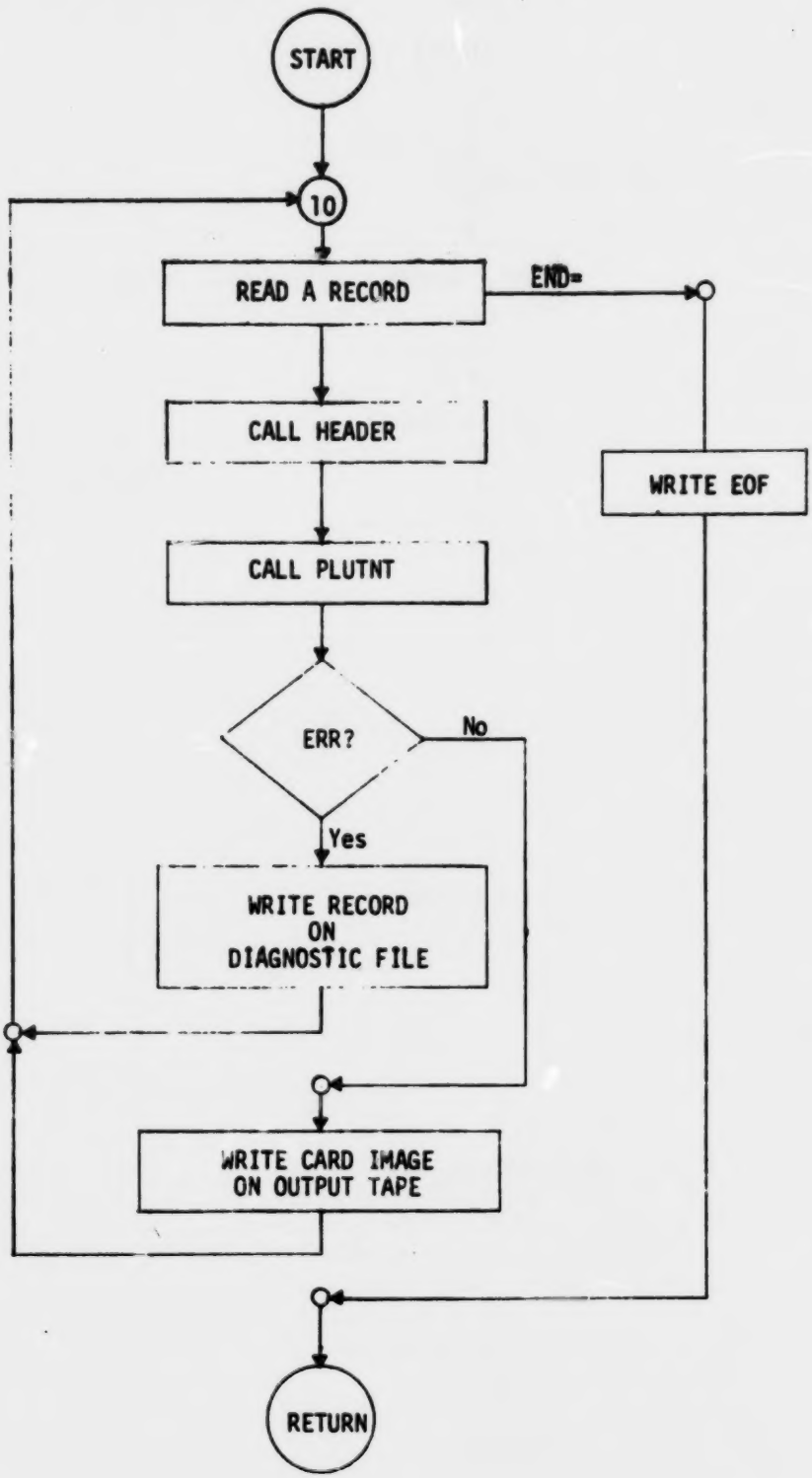


Figure 2-2 (continued) (SUBROUTINE REC5)

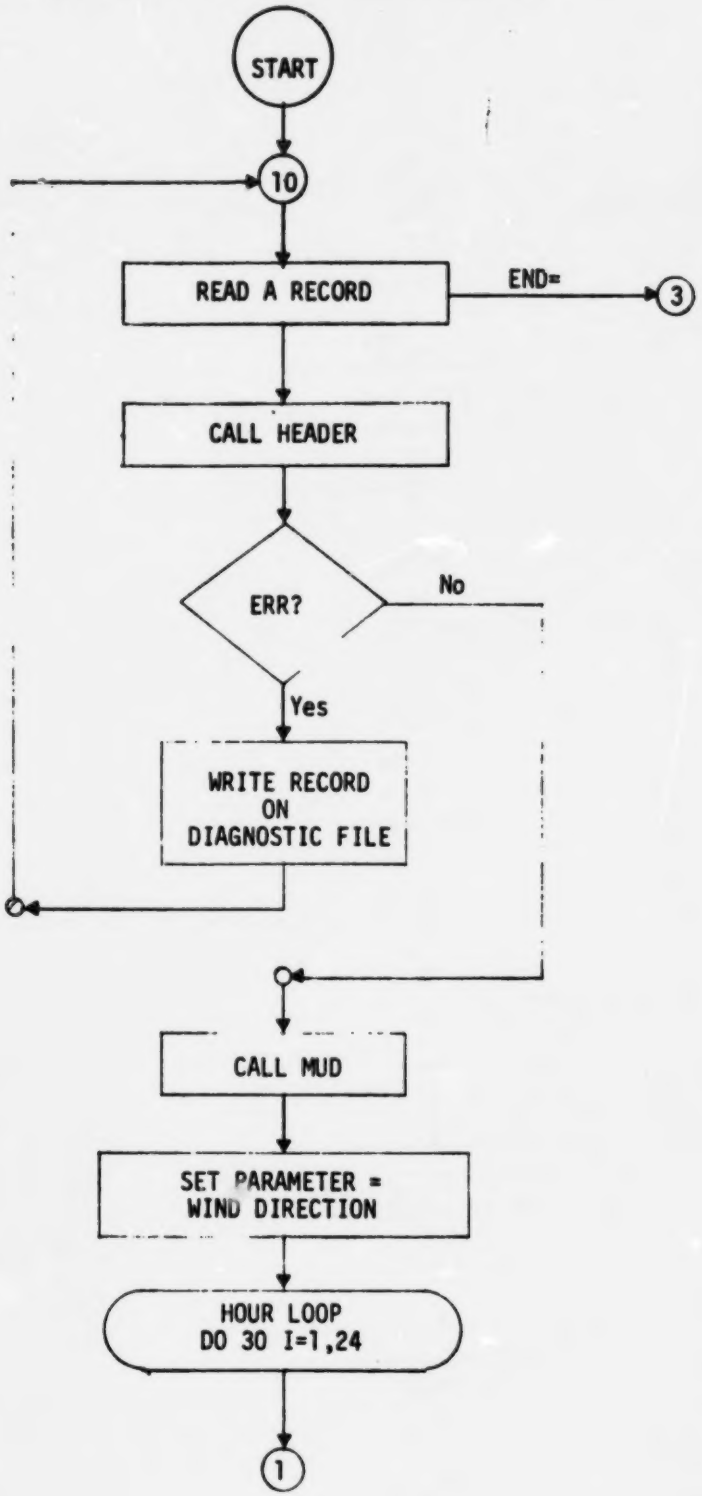


Figure 2-2 (continued) (SUBROUTINE REC5)

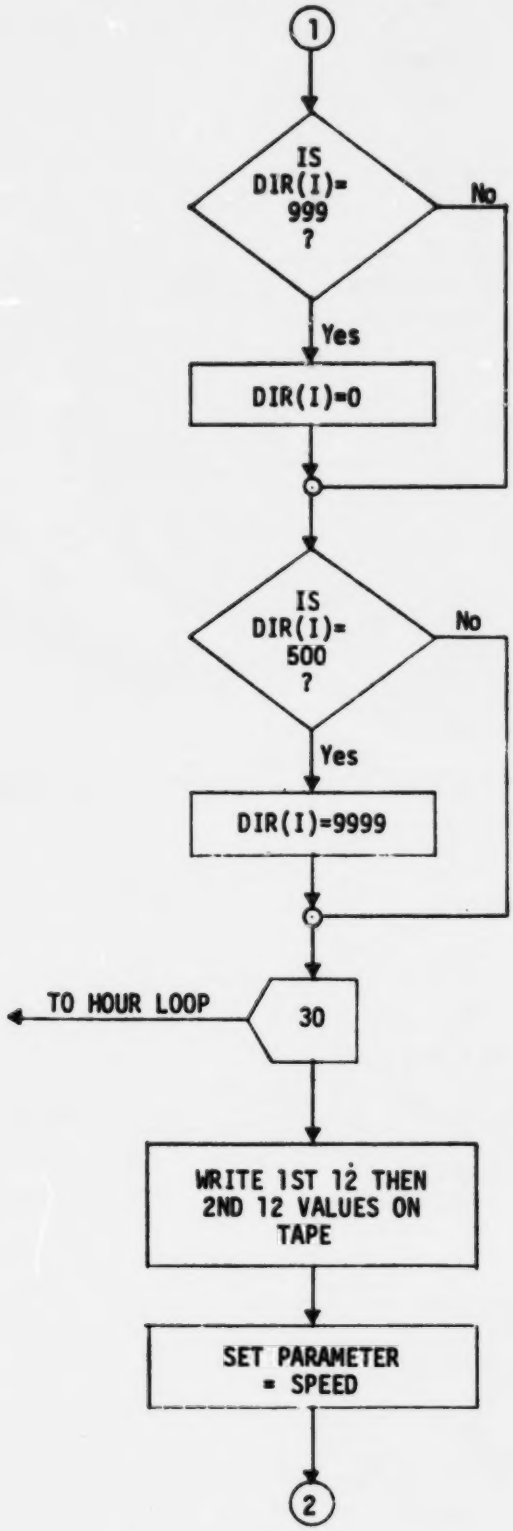


Figure 2-2 (continued) (SUBROUTINE REC5)

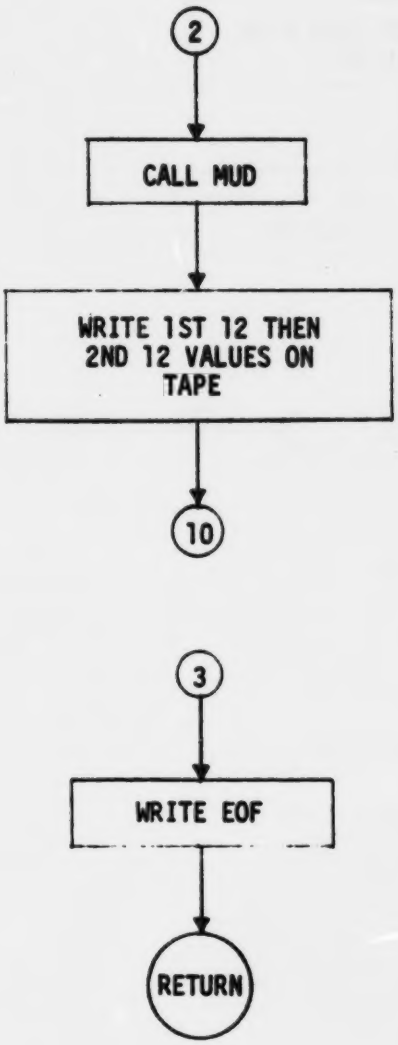


Figure 2-2 (continued) (SUBROUTINE HEADER)

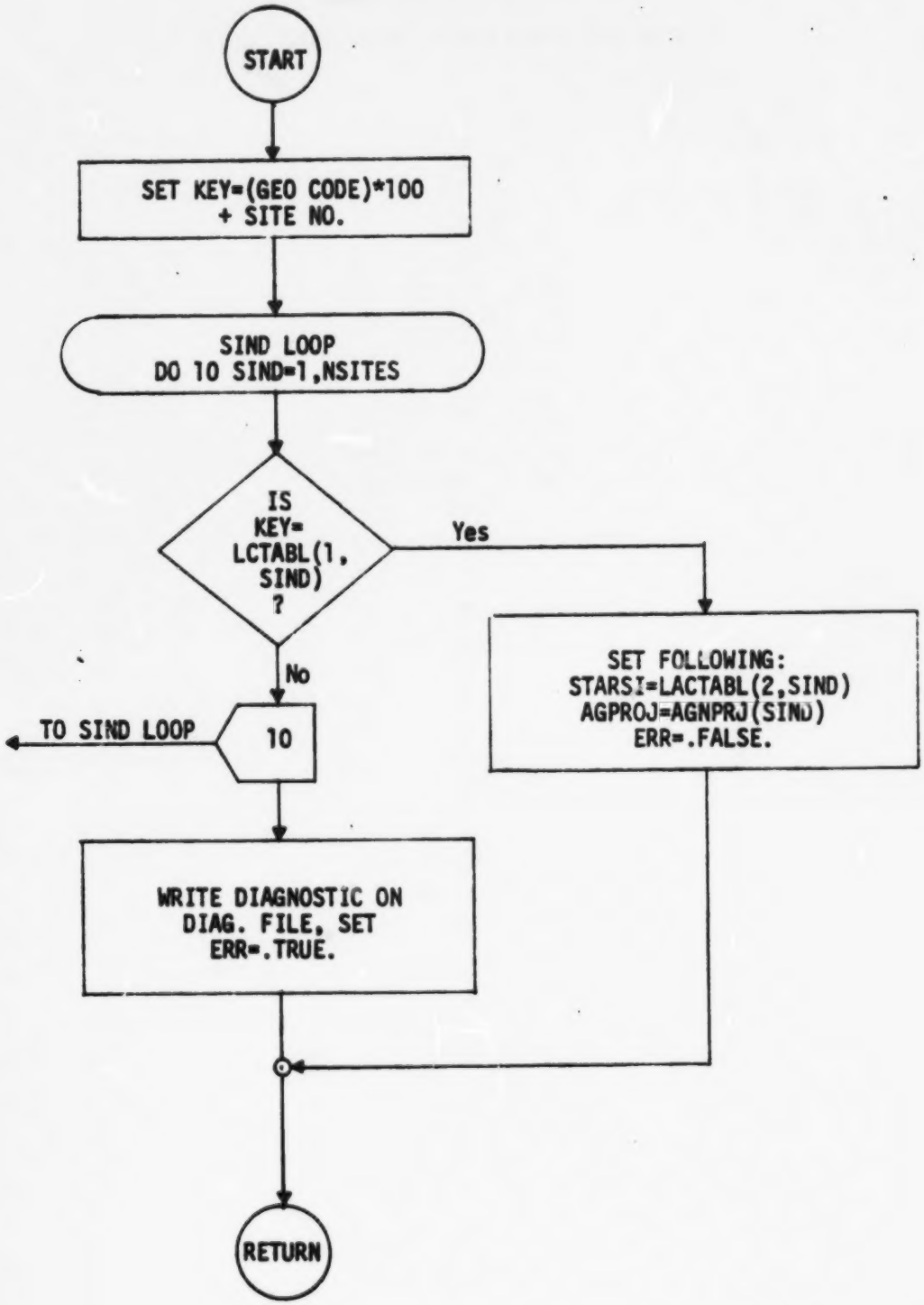


Figure 2-2 (continued) (SUBROUTINE PLUTNT)

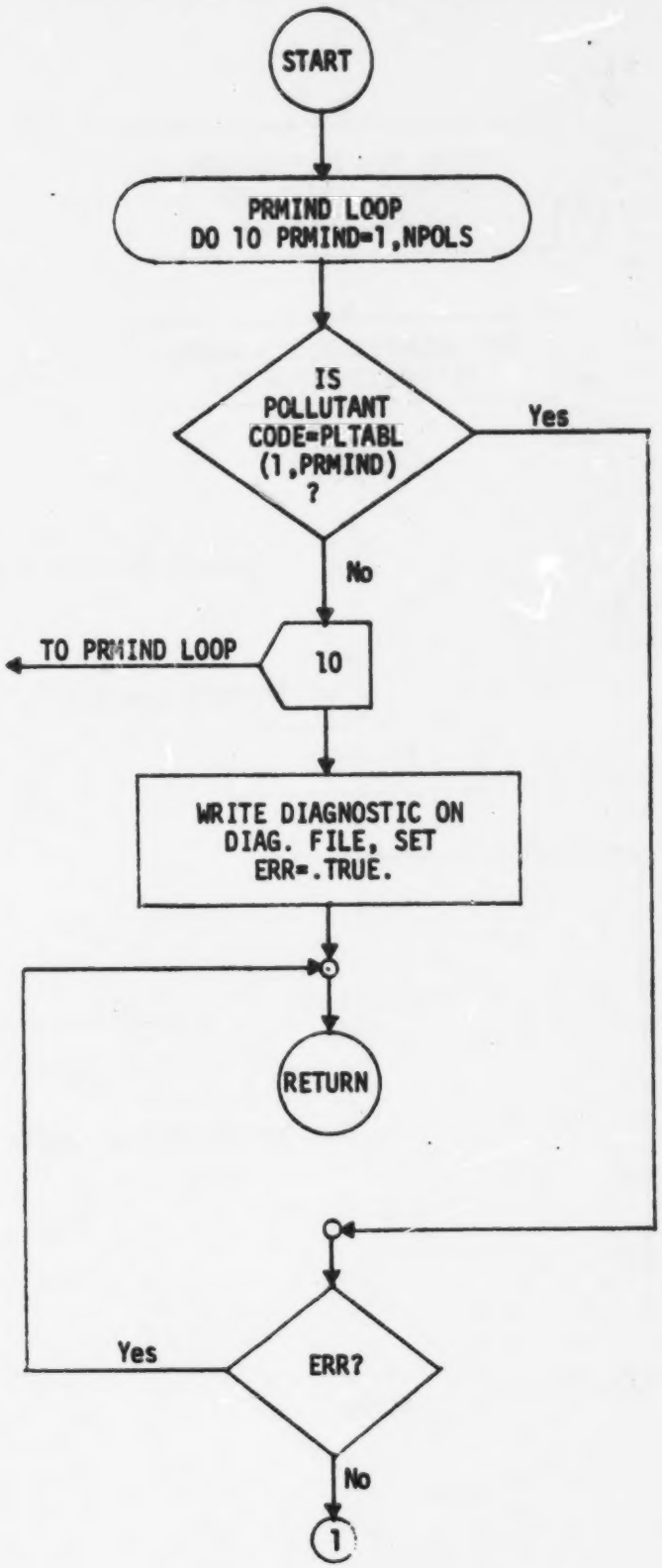


Figure 2-2 (continued) (SUBROUTINE PLUTNT)

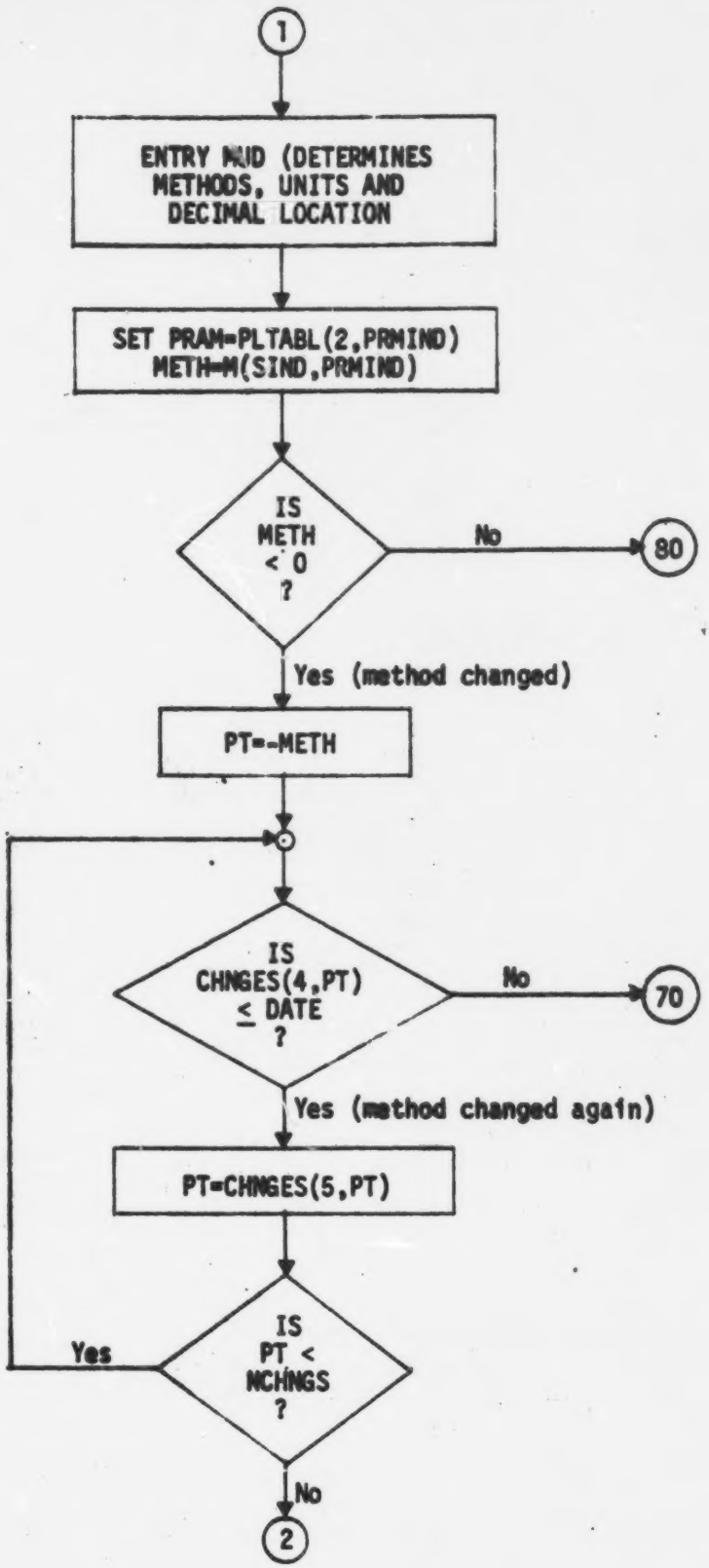
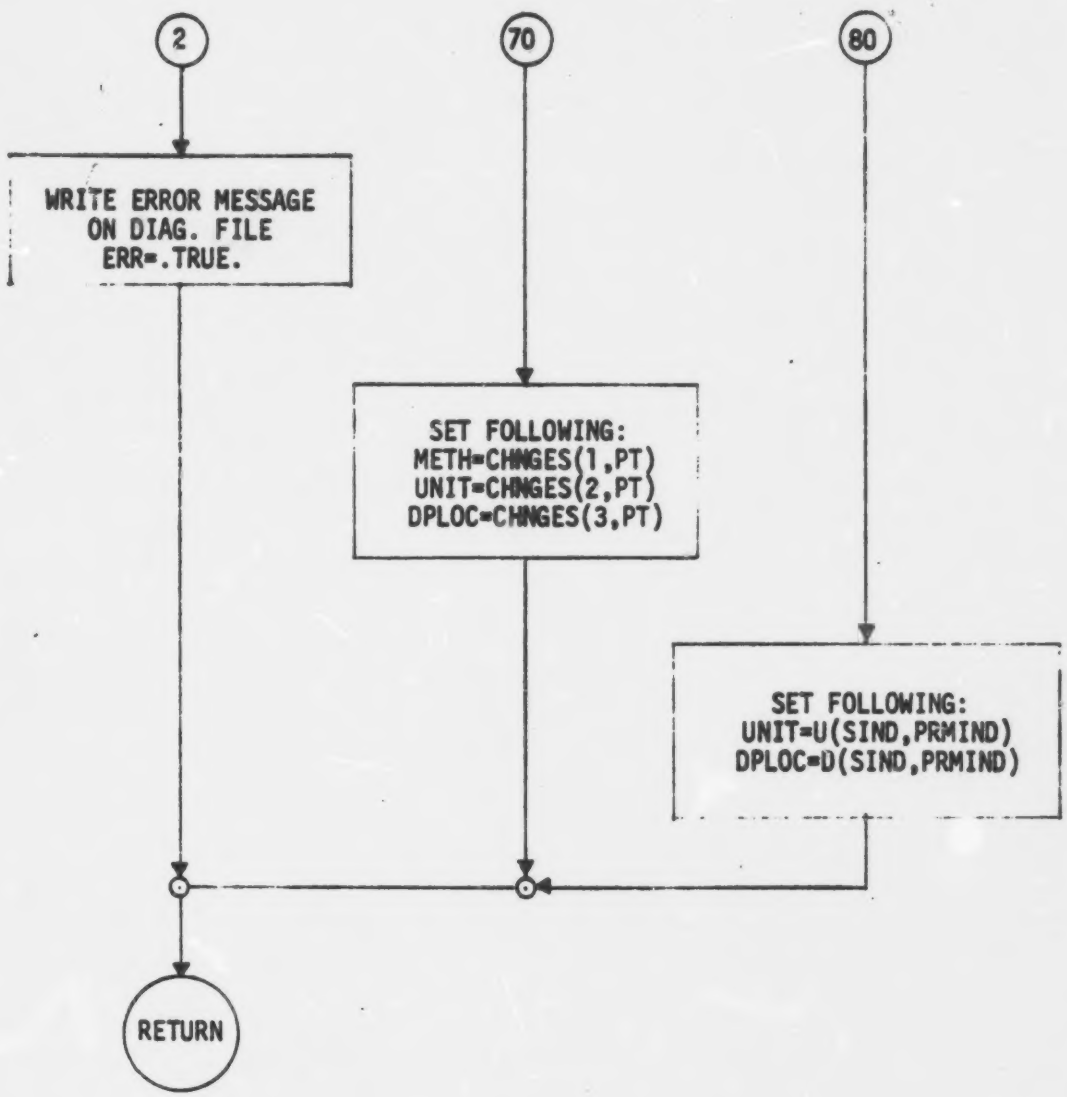


Figure 2-2 (continued) (SUBROUTINE PLUTNT)



III. INPUT DATA DESCRIPTION

A. DETAILED DESCRIPTION OF INPUT FOR PREPROCESSOR

The input to the PREPROCESSOR program consists of one file of card images of 150 bytes per card. All of the card images contain a 16-digit heading in unpacked decimal format as shown in Tables 3-1 through 3-4. The format of the various record types are extracted from Illinois EPA [3].

The records fall into two categories. Record type 3 makes up the first category. It contains daily data in unpacked decimal, four digits to a pollutant. The data starts in column 17. Leading zeros should be present as opposed to leading blanks. Unused fields should be filled with blanks.

Record types 1, 2, and 5 form the other category. These contain data from hourly or two hour samples in a packed decimal format with three bytes to a value. The records should be padded with blanks to fill out the record.

B. DETAILED DESCRIPTION OF INPUT FOR CONVERSION

Input to the CONVERSION program is limited only to the output tape created by the PREPROCESSOR program.

This preprocessed tape is made up of four files, one corresponding to each record type 3, 2, 1, and 5 in that order. File 1 (record type 3) has a logical record length of 150 bytes. Files 2, 3, and 4 (record types 2, 1, and 5, respectively) all have logical record lengths of 300 bytes. Physical record blocking is determined by appropriate JCL statements.

TABLE 3-1

FORMAT OF RECORD TYPE NO. 3 -
24 HOUR SAMPLING TIME

Columns From	To	PIC	Field Description
1	6	9(6)	Geographic Code
7	8	99	Filler
9	10	99	Site No.
11	12	99	Year
13	14	99	Month
15	16	99	Day
17	20	9(4)	Particulate
21	24	99V99	H_2S
25	28	99V99	COH
29	32	9V999	SO_2
33	36	999V9	Organic
37	40	99V99	PH
41	44	99V99	Lead
45	48	999V9	Fluoride
49	149	X(99)	Filler
150		9	REC Type=3

TABLE 3-2

FORMAT OF RECORD TYPE NO. 1 -
2 HOUR SAMPLING TIME

Columns From	To	PIC	Description of Field
1	6	9(6)	Geographic Code
7	8	99	Pollutant Code
9	10	99	Site Number
11	12	99	Year
13	14	99	Month
15	16	99	Day
17	19	S9(5)	Sample Value-Packed Decimal-(Occurs 24 times)
---	---	---	---
89	149	X(61)	Filler
150		9	REC Type=1

TABLE 3-3

FORMAT OF RECORD TYPE NO. 2 -
1 HOUR SAMPLING TIME

Columns From	To	PIC	Description of Field
1	6	9(6)	Geographic Code
7	8	99	Pollutant Code
9	10	99	Site Number
11	12	99	Year
13	14	99	Month
15	16	99	Day
17	19	S9(5)	Sample Value-Packed Decimal-(Occurs 24 times)
---	---	---	---
89	149	X(61)	Filler
150		9	REC Type=2

TABLE 3-4

FORMAT OF RECORD TYPE NO. 5 -
METEOROLOGICAL DATA

Columns From	To	PIC	Field Description
1	6	9(6)	Geographic Code
7	8	99	Filler
9	10	99	Site No.
11	12	99	Year
13	14	99	Month
15	16	99	Day
17	19	S9(5)	Wind Direction 9(3), Wind Speed 9(2) — Packed Decimal (Occurs 24 times)

89	149	X(61)	Filler
150		9	REC Type=5

IV. SAMPLE CASE

A sample tape containing Illinois state air quality data was used to demonstrate the conversion of the data to SAROAD format.

A. INPUT/OUTPUT DATA FOR PREPROCESSOR

The input tape has only one file consisting of four types of records with formats as presented in Tables 3-1 through 3-4. The PREPROCESSOR can accept these records in any random order. A sample of each of these record types before processing is shown in Table 4-1. The printed output is in hexadecimal so that there are two characters for every byte of core.

The output from the PREPROCESSOR is a four file tape -- one file for each record type in the order 3, 2, 1, and 5. File 1 (record type 3) has a logical record length of 150 bytes. Files 2, 3, and 4 (for record types 2, 1, and 5, respectively) all have logical lengths of 300 bytes. Table 4-2 illustrates the preprocessed records corresponding to the input from Table 4-1. The printed output is again in hexadecimal. Note that the printed output is not a part of the PREPROCESSOR, but rather it comes from "tape dumps" of the input and output tapes generated by a Walden program.*

B. INPUT/OUTPUT DATA FOR CONVERSION

The only input data to the CONVERSION program is the preprocessed tape written by the PREPROCESSOR. When the preprocessed data (Table 4-2) is read by CONVERSION (in FORTRAN), the data is interpreted in a manner as shown in Table 4-3.

The normal output from CONVERSION is an unlabelled tape consisting of four files of card images of eighty columns per record. Each file corresponds to each record type. Additionally, printed output may also be obtained by setting the variable OPTION to a non-integer value (see Appendix E). When this option is exercised, printed output of the form shown in

---

*Program LIST.

TABLE 4-1

SAMPLE INPUT AIR QUALITY DATA FORMAT

Record Type 3:

```
F0F0F0F0F3F040400FCF1F7F3F0F4F0F4F0F0F1F540404040404
4040404040404040404040404040404040404040404040404040
4040404040404040404040404040404040404040404040404040
4040404040404040404040404040404040404040404040404040
4040404040404040404040404040404040404040404040404040
4040404040404040404040404040404040404040404040404F3
```

Record Type 2:

```
F0F1F4F0F3F0F3F2F0F1F7F3F0F4F0F1000100C0002000020C
0002000010C000010C000010C000010C000010C000010C00
0100C0001000C0001000C0001000C0001000C0001000C00020C00020C0001
0C0001000C0001000C0001000C0001000C4040404040404040404040
4040404040404040C404C4040404040404040404040404040404040
4040404040404040404040404040404040404040404040404F2
```

Record Type 1:

```
F0F1F6F0F1F2F1F0F0F1F7F3F0F4F0F1404040404040404040
4040404040404040404040404040404040404040404040404040
4040000020C0002000020C0002000020C0002000020C0002
0C0002000020C0002000020C0002000020C4040404040404040404040
4040404040404040404040404040404040404040404040404040
4040404040404040404040404040404040404040404040404F1
```

TABLE 4-1 (continued)

Record Type 5:

F0F1F6F0F1F24040F0F2F7F3F0F4F0F1404040404040404040

4040404040404040404040404040404040404040404040404015

810C1801 0C 1801 0C 18009C18009C18009C20310C20310C2251

4C22512C 22512C 22512C 22512C4040404040404040404040404040

4040404040404040404040404040404040404040404040404040

4040404040404040404040404040404040404040404040404040F5

TABLE 4-2

SAMPLE PREPROCESSED DATA FORMAT -
OUTPUT OF PREPROCESSOR

Record Type 3: F0F0F6F0F3F0404 0F0F1F 7F3F0F4F0F4F0F0F1F5F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F0F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F3

Record Type 2: F0F1F4F0F3F0F3F2F0F1F 7F3F0F4F0F1F0F0F0F0F1F0F0F0F0

F0F2F0F0F0F0F0F2F0F0F0F0F0F0F1F0F0F0F0F0F0

F1F0F0F0F0F0F1F0F0F0F0F0F0F1F0F0F0F0F0F1F0F0F0F0F0F1

F0F0F0F0F0F1F0F0F0F0F0F0F1F0F0F0F0F0F1F0F0F0F0F0F1F0

F0F0F0F0F1F0F0F0F0F0F0F1F0F0F0F0F0F1F0F0F0F0F0F2F0F0

F0F0F0F2F0F0F0F0F0F0F1F0F0F0F0F0F1F0F0F0F0F0F1F0F0F0

F0F0F1F0F0F0F0F0F0F1F0F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F2

TABLE 4-2 (continued)

Record Type 1: F0F1F6F0F1F2F1F0F0F1F 7F3F 0F4F0F1F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F0F0F0F0F0F2F0F0F0F0F0F0F2F0

F0F0F0F0F2F0F0F0F0F0F0F2F0F0F0F0F0F0F2F0F0F0F0F0F0F2F0F0

F0F0F0F2F0F0F0F0F0F0F2F0F0F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F1

Record Type 5: F0F1F6F0F1F2F0F0F2F 7F3F 0F4F0F1F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F0F1F5F9F1F0F0F1F8F0F1F0F0F1F8F0F1F0

F0F1F8F0F0F9F0F1F8F0F0F9F0F1F8F0F0F9F0F2F0F3F1F0F0

F2F0F3F1F0F0F2F2F5F1F4F0F2F2F5F1F2F0F2F2F5F1F2F0F2

F2F5F1F2F0F2F2F5F1F2F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9

F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F9F5

TABLE 4-3

PREPROCESSED DATA AS READ BY
THE CONVERSION PROGRAM

```
Record Type 3: 006030  C173040400155999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999993

Record Type 2: 0010000010599999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999992
               0010000010599999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999992

Record Type 1: 0020000020999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999991
               0020000020999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999991

Record Type 5: 2512022512999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999995
               2512022512999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999999
               999999999999999999999999999999999999999999999999995
```

Table 4-4 will be produced. Each pair of lines refer to one record. The first line is the Illinois record, and the second is the converted SAROAD counterpart.

TABLE 4-4

SAMPLE OPTIONAL OUTPUT FROM CONVERSION PROGRAM

RECORD TYPE 2.

```
      6030     1    730404                                  15
2140680C01F01773040 4 C1110191 10                           15
      6030     1    730410                                  84
2140680C01F01773041C C1110191 10                            84
      6030     1    730416                                  23
2140680C01F01773041E C1110191 10                            23
      6030     1    730422                                 106
2140680C01F01773042Z C1110191 10                           106
      6030     1    730428                                 102
2140680C01F01773042E C1110191 10                           102
      10010    1    730402                                  41
2141140C01F01773040Z C1110191 10                            41
      10010    1    730404                                  32
2141140C01F01773040 4 C1110191 10                           32
      10010    1    730419                                  32
2141140C01F01773041S C1110191 10                            32
      10010    1    730422                                  37
2141140C01F01773042Z C1110191 10                            37
      10010    1    730425                                  60
2141140C01F01773042S C1110191 10                            60
      10010    1    730428                                  92
2141140C01F01773042E C1110191 10                            92
      10010    1    730504                                  84
2141140C01F01773050 4 C1110191 10                           84
      14030    1    730404                                  13
2140E80C01F03773040 4 C1110191 10                           13
      14030    1    730410                                  17
2140E80C01F03773041C C1110191 10                            17
      14030    1    730428                                  65
2140E80C01F03773042E C1110191 10                            65
      16006    8    730401                                  43      9999      9999      9999      9999      9999      9999      9999
2141540C01601773040 1 C1110191 10                           43 434240191 73  2
      16006    8    730403                                  62      9999      9999      9999      9999      9999      9999      9999
2141540CC1601773040 3 C1110191 10                           62 624240191 73  1
      16006    8    730405                                  82      9999      9999      9999      9999      9999      9999      9999
2141540CC1601773040 5 C1110191 10                           82 824240191 73  2
      16006    8    730408                                  74      9999      9999      9999      9999      9999      9999      9999
2141540C01601773040E C1110191 10                            74 744240191 73  2
      16006    8    730410                                  49      9999      9999      9999      9999      9999      9999      9999
2141540CC1601773041C C1110191 10                            49 494240191 73  2
      16006    8    730412                                  69      9999      9999      9999      9999      9999      9999      9999
2141540CC1601773041Z C1110191 10                            69 694240191 73  4
      16006    8    730415                                 126      9999      9999      9999      9999      9999      9999      9999
2141540C01601773041S C1110191 10                           126 1264240191 73  3
      16006    8    730417                                  90      9999      9999      9999      9999      9999      9999      9999
2141540C01601773041E C1110191 10                            90 904240191 73  1
```

RECORD TYPE 2.

TABLE 4-4 (continued)

Reproduced from best available copy.

TABLE 4-4 (continued)

RECORD TYPE 1.

```
          16012   1C    1 730401   9999   9999   9999   9999   9999   9999     20     20     20     20     20     20
1141540002H012730401 C1120181 S2999999999999999999999999  20  20  20  20  20  20
          16012   1C    1 730402     20     20     20     20     20     20     30     30     30     30     20     20
1141540002H012730402 C1120181 S2  20  20  20  20  20  20  30  30  30  30  20  20
          16012   1C    1 730403     40     40     30     30     30     60     90     60     40     20
1141540002H012730403 C1120181 S2  40  40  30  30  30  30  30  60  90  60  40  20
          16012   1C    1 730404     20     20     20     30     40     40     40     40     40     40     30     20
1141540002H012730404 C1120181 S2  20  20  20  30  40  40  40  40  40  40  30  20
          16012   1C    1 730405     20     20     20     30     30     20     20     20     20     20     20     20
1141540002H012730405 C1120181 S2  20  20  20  30  30  20  20  20  20  20  20  20
          16012   1C    1 730406     20     20     20     20     20     20     20     20     20     20     20     20
1141540002H012730406 C1120181 S2  20  20  20  20  20  20  20  20  20  20  20  20
          16012   1C    1 730407     20     40     20     20     40    100     80     80     40     40     20     20
1141540002H012730407 C1120181 S2  20  40  20  20  40 100  80  80  40  40  20  20
          16012   1C    1 730408     20     20     20     20     20     20     20     20     40     60
1141540002H012730408 C1120181 S2  20  20  20  20  20  20  20  20  20  20  40  60
          16012   1C    1 730409     40     20     40     40     40     40     40     20     20     20     20     20
1141540002H012730409 C1120181 S2  40  20  40  40  40  40  40  40  20  20  20  20
          16012   1C    1 730410     20     20     20     20     20     20     20     20     40     40
1141540002H012730410 C1120181 S2  20  20  20  20  20  20  20  20  20  20  40  40
          16012   1C    1 730411     40     40     40     40     20     20     20     20     20     20
1141540002H012730411 C1120181 S2  40  40  40  40  20  20  20  20  20  20  20  20
          16012   1C    1 730412     40     20     20     40     40     40     40     40     40     40
1141540002H012730412 C1120181 S2  40  20  20  40  40  40  40  40  40  40  40  40
          16012   1C    1 730413     60     60     80     80     80     80     60     60     70     70
1141540002H012730413 C1120181 S2  60  60  80  80  80  80  60  60  70  70  90  70
          16012   1C    1 730414     20     20     20     20     20     20     20     20     40     40
1141540002H012730414 C1120181 S2  20  20  20  20  20  20  20  20  40  40  40  40
          16012   1C    1 730415     20     20     20     20     20     20     20     20     20     20
1141540002H012730415 C1120181 92  20  20  20  20  20  20  20  20  20  20  20  20
          16012   1C    1 730416     20     20     20     20     20     20     20     20     40     40
1141540002H012730416 C1120181 92  20  20  20  20  20  20  20  20  20  20  40  40
          16012   1C    1 730417     30     30     30     30     30     30     30     20     20     20
1141540002H012730417 C1120181 S2  30  30  30  30  30  20  20  20  30  30  30  20
          16012   1C    1 730418     40     40     60     70    100    100     60     40     40     40     30     30
1141540002H012730418 C1120181 S2  40  40  60  70 100 100  60  40  40  40  30  30
          16012   1C    1 730419     20     20     30     30     20     20     20     20     40     40
1141540002H012730419 C1120181 92  20  20  30  30  20  20  20  20  20  20  40  40
          16012   1C    1 730420     20     20     20     20     20     20     20     20     20     20
1141540002H012730420 C1120181 S2  20  20  20  20  20  20  20  20  20  20  20  20
          16012   1C    1 730421     20     20     20     20     20     20     20     20     20     0
1141540002H012730421 C1120181 S2  20  20  20  20  20  20  20  20  20  20  20  0
          16012   1C    1 730422     20     20     20     20     20     20     20     20     20     20
1141540002H012730422 C1120181 92  20  20  20  20  20  20  20  20  20  20  20  20
          16012   1C    1 730428     40     40     20     20     20     20     20     40     60     70     70
1141540002H012730428 C1120181 92  40  40  20  20  20  20  20  20  40  60  70  70
```

TABLE 4-4 (continued)

```
RECORD TYPE 5.
      16012   2  730401999999999
```

V. MISCELLANEOUS OPERATIONAL INFORMATION

A. SYSTEMS AND CPU TIMES

The PREPROCESSOR and the CONVERSION programs were executed and debugged on an IBM 360/65 machine. Both programs require two tape drives for simultaneous processing of input and output data.

For the PREPROCESSOR, the IBM ASSEMBLER used, requires approximately 100 K and 15 seconds to compile the program. The program then will sort 1500 records and output them in 5 to 10 seconds while using less than 10 K of memory.

For the CONVERSION program, the compiler requires 100 K and about 15 seconds of CPU time. The compiled program will run under 50 K bytes of core and process 1500 records in about 20 seconds.

B. PROGRAM MESSAGES

No diagnostic messages are written by the PREPROCESSOR program.

Specific problems that may be encountered in the normal execution of the CONVERSION program are signalled by the presence of program messages. These diagnostics are briefly discussed below.

If the CONVERSION program cannot process a record, it writes a message identifying the problem followed by a printout of the input Illinois record. The various diagnostics are: (1) 'SITE NOT LOCATED.'; (2) 'POLLUTANT XX NOT CODED FOR.', which occurs only in record type 3 and means that although the pollutant had a place reserved for it (because of the nature of record type 3), no corresponding information on method, units, and decimal place was coded; (3) 'POLLUTANT CODE XX NOT FOUND.', meaning that the pollutant code xx is not present in the list of pollutants and in subroutine PLUTNT; (4) 'METHOD CHANGE ERROR. POINTER EXCEEDS NO. OF CHANGES.', which means a method change was incorrectly encoded. After writing the problem record, the program reads a new record and resumes processing.

VI. REFERENCES

1. Fair, D. H., Morgan, G. B., and Zimmer, C. E., SAROAD System Description and Data Coding Manual, U.S. Department of Health, Education and Welfare, National Air Pollution Control Administration (Publication No. APTD 68-8), Cincinnati, Ohio (August 1968).

2. Users Manual: SAROAD (Storage and Retrieval of Aerometric Data), U.S. Environmental Protection Agency, Office of Air Programs (Publication No. APTD-0663), Research Triangle Park, N.C. (July 1971).

3. Personal Communications, Illinois Environmental Protection Agency, Division of Air Pollution Control, Springfield, Illinois (July 1973).

4. Fair, D. H., Clements, J. B., and Morgan, G. B., SAROAD Parameter Coding Manual, U.S. Environmental Protection Agency, Office of Air Programs (Publication No. APTD-0633), Research Triangle Park, N.C. (July 1971).

APPENDIX A

SOURCE LISTING OF PREPROCESSOR PROGRAM

```
STMT   SOURCE STATEMENT                                          F01FEB73   8/23/73

    1 CONVERT  START                                                        CNVT
    2          SAVE (14,12)                                                 CNVT
    3+         DS    0H
    4+         STM   14,12,12(13) SAVE REGISTERS
    5          BALR 5,0                                                     CNVT
    6          USING *,5                                                    CNVT
    7          ST 13,SAVE13                                                 CNVT
    8          LA 13,SAVEAREA                                               CNVT
    9          LA 8,TAIL                                                    CNVT
   10          OPEN (WDCB3,(OUTPUT))                                        CNVT
   11+         CNOP  0,4 ALIGN LIST TO FULLWORD
   12+         BAL   1,*+8 LOAD REG1 W/LIST ADDR.
   13+         DC    AL1(143) OPTION BYTE
   14+         DC    AL3(WDCB3) DCB ADDRESS
   15+         SVC   19 ISSUE OPEN SVC
   16          LA 4,WDCB3                                                   CNVT
   17 BGIN     OPEN (RDCB)                                                  CNVT
   18+         CNOP  0,4 ALIGN LIST TO FULLWORD
   19+BGIN     BAL   1,*+8 LOAD REG1 W/LIST ADDR.
   20+         DC    AL1(128) OPTION BYTE
   21+         DC    AL3(RDCB) DCB ADDRESS
   22+         SVC   19 ISSUE OPEN SVC
   23 RECURSE  GET RDCB,INPUT                                               CNVT
   24+RECURSE  LA    1,RDCB LOAD PARAMETER REG 1
   25+         LA    0,INPUT LOAD PARAMETER REG 0
   26+         L     15,48(0,1) LOAD GET ROUTINE ADDR.
   27+         BALR  14,15 LINK TO GET ROUTINE
   28          CLC TAIL,REC=                                                CNVT
   29          BNE RECURSE                                                  CNVT
   30          MVC   WHEAD,HEAD                                             CNVT
   31          LA 6,HEAD+16                                                 CNVT
   32          LA 7,WHEAD+16                                                CNVT
   33          CLI TAIL,X'F3'                                               CNVT
   34          BE THREE                                                     CNVT
   35 *        RECORD TYPE IS 1,2, OR 5.                                    CNVT
   36 COMP     CLI 0(R6),X'40'                                              CNVT
   37          BE BLANK                                                     CNVT
   38          UNPK  0(6,R7),0(3,R6)                                        CNVT
   39          OI 5(R7),X'F0'              CHANGE SIGN CODE TO F            CNVT
   40          MVN SIGN,2(R6)              MOVE SIGN BITS                   CNVT
   41          CLI SIGN,X'D'               CHECK FOR MINUS                  CNVT
   42          BNE PLUS                                                     CNVT
   43          MVI 0(R7),X'60'             INSERT A MINUS SIGN              CNVT
   44 PLUS     A R6,B3                                                      CNVT
   45          A R7,SIX                                                     CNVT
   46          B S150                                                       CNVT
   47 *        BYTE CONTAINS A BLANK.                                       CNVT
   48 BLANK    MVC 0(2,R7),NINES                                            CNVT
   49          A R6,ONE                                                     CNVT
   50          A R7,TWO                                                     CNVT
   51 S150     CR 6,8                                                       CNVT
   52          BL COMP                                                      CNVT
   53          MVC 0(17,R7),NINES          FILL WITH NINES                  CNVT
   54          MVC WTAIL,TAIL                                               CNVT
   55 *  FINISHED RECORD. PUT IT IN OUTPUT BUFFER WITH MODIFIED PUT ROUTINE.  CNVT
```

```
STMT   SOURCE STATEMENT                                        F01FEB73   8/23/73

  56 FILL     LR 1,4                          INSERT WDCB ADDRESS IN R1      CNVT
  57          LA 0,OUTPUT                     LOAD OUTPUT ADDRESS IN R0      CNVT
  58          L 15,48(0,1)                    LOAD PUT ROUTINE ADDRESS       CNVT
  59          BALR 14,15                      LINK TO PUT ROUTINE            CNVT
  60          B RECURSE                                                      CNVT
  61 *        RECORD TYPE=3.                                                 CNVT
  62 THREE    CLI 0(R6),X'40'                                                CNVT
  63          BE BLNK3                                                       CNVT
  64          MVC 0(1,R7),0(R6)               MOVE NUMBER.                   CNVT
  65          B T150                                                         CNVT
  66 BLNK3    MVI 0(R7),X'F9'                 INSERT A NINE.                 CNVT
  67 T150     A R6,ONE                                                       CNVT
  68          A R7,ONE                                                       CNVT
  69          CR 6,8                                                         CNVT
  70          BL THREE                                                       CNVT
  71          MVI WTAIL3,X'F3'                                               CNVT
  72          B FILL                                                         CNVT
  73 *        END OF TAPE                                                    CNVT
  74 FIN      CLI   REC=,X'F5'                                               CNVT
  75          BE    C5                                                       CNVT
  76          CLOSE (RDCB,REREAD)                                            CNVT
  77+         CNOP  0,4 ALIGN LIST TO FULLWORD
  78+         BAL   1,*+8 LOAD REG1 W/LIST ADDR
  79+         DC    AL1(144) OPTION BYTE
  80+         DC    AL3(RDCB) DCB ADDRESS
  81+         SVC   20 ISSUE CLOSE SVC
  82          CLI REC=,X'F3'                                                 CNVT
  83          BNE C2                                                         CNVT
  84          CLOSE (WDCB3,LEAVE)                                            CNVT
  85+         CNOP  0,4 ALIGN LIST TO FULLWORD
  86+         BAL   1,*+8 LOAD REG1 W/LIST ADDR
  87+         DC    AL1(176) OPTION BYTE
  88+         DC    AL3(WDCB3) DCB ADDRESS
  89+         SVC   20 ISSUE CLOSE SVC
  90          OPEN (WDCB2,(OUTPUT))                                          CNVT
  91+         CNOP  0,4 ALIGN LIST TO FULLWORD
  92+         BAL   1,*+8 LOAD REG1 W/LIST ADDR.
  93+         DC    AL1(143) OPTION BYTE
  94+         DC    AL3(WDCB2) DCB ADDRESS
  95+         SVC   19 ISSUE OPEN SVC
  96          LA 4,WDCB2                                                     CNVT
  97          MVI REC=,X'F2'                                                 CNVT
  98          B BGIN                                                         CNVT
  99 C2       CLI REC=,X'F2'                                                 CNVT
 100          BNE C1                                                         CNVT
 101          CLOSE (WDCB2,LEAVE)                                            CNVT
 102+         CNOP  0,4 ALIGN LIST TO FULLWORD
 103+         BAL   1,*+8 LOAD REG1 W/LIST ADDR
 104+         DC    AL1(176) OPTION BYTE
 105+         DC    AL3(WDCB2) DCB ADDRESS
 106+         SVC   20 ISSUE CLOSE SVC
 107          OPEN (WDCB1,(OUTPUT))                                          CNVT
 108+         CNOP  0,4 ALIGN LIST TO FULLWORD
 109+         BAL   1,*+8 LOAD REG1 W/LIST ADDR.
 110+         DC    AL1(143) OPTION BYTE
```

```
STMT   SOURCE STATEMENT                                          F01FE873   8/23/73

 111+          DC    AL3(WDCB1) DCB ADDRESS
 112+          SVC   19 ISSUE OPEN SVC
 113           LA 4,WDCB1                                                  CNVT
 114           MVI REC=,X'F1'                                              CNVT
 115           B BGIN                                                      CNVT
 116 C1        CLOSE (WDCB1,LEAVE)                                         CNVT
 117+          CNOP  0,4 ALIGN LIST TO FULLWORD
 118+C1        BAL   1,*+8 LOAD REG1 W/LIST ADDR
 119+          DC    AL1(176) OPTION BYTE
 120+          DC    AL3(WDCB1) DCB ADDRESS
 121+          SVC   20 ISSUE CLOSE SVC
 122           OPEN (WDCB5,(OUTPUT))                                       CNVT
 123+          CNOP  0,4 ALIGN LIST TO FULLWORD
 124+          BAL   1,*+8 LOAD REG1 W/LIST ADDR.
 125+          DC    AL1(143) OPTION BYTE
 126+          DC    AL3(WDCB5) DCB ADDRESS
 127+          SVC   19 ISSUE OPEN SVC
 128           LA 4,WDCB5                                                  CNVT
 129           MVI REC=,X'F5'                                              CNVT
 130           B BGIN                                                      CNVT
 131 C5        CLOSE (RDCB,,WDCB5)                                         CNVT
 132+          CNOP  0,4 ALIGN LIST TO FULLWORD
 133+C5        BAL   1,*+12 LOAD REG1 W/LIST ADDR
 134+          DC    AL1(0) OPTION BYTE
 135+          DC    AL3(RDCB) DCB ADDRESS
 136+          DC    AL1(128) OPTION BYTE
 137+          DC    AL3(WDCB5) DCB ADDRESS
 138+          SVC   20 ISSUE CLOSE SVC
 139           L 13,SAVE13                                                 CNVT
 140           RETURN (14,12),,RC=0                                        CNVT
 141+          LM    14,12,12(13) RESTORE THE REGISTERS
 142+          LA    15,0(0,0) LOAD RETURN CODE
 143+          BR    14 RETURN
 144 INPUT     DS 0D                                                       CNVT
 145 HEAD      DS ZL16                                                     CNVT
 146           DS 133Z                                                     CNVT
 147 TAIL      DS Z                                                        CNVT
 148 OUTPUT    DS 0D                                                       CNVT
 149 WHEAD     DS ZL16                                                     CNVT
 150           DS 133Z                                                     CNVT
 151 WTAIL3    DS Z                                                        CNVT
 152           DS 149Z                                                     CNVT
 153 WTAIL     DS Z                                                        CNVT
 154 REC=      DC X'F3'                                                    CNVT
 155 SAVE13    DS F                                                        CNVT
 156 SAVEAREA  DS 18F                                                      CNVT
 157 ONE       DC XL4'1'                                                   CNVT
 158 TWO       DC XL4'2'                                                   CNVT
 159 B3        DC XL4'3'                                                   CNVT
 160 SIX       DC XL4'6'                                                   CNVT
 161 NINES     DC 17X'F9'                                                  CNVT
 162 SIGN      DC X'0'                                                     CNVT
 163 R6        EQU 6                                                       CNVT
 164 R7        EQU 7                                                       CNVT
 165 RDCB      DCB   DDNAME=READ,MACRF=GM,DSORG=PS,EODAD=FIN               CNVT
```

```
STMT   SOURCE STATEMENT                                        F01FEB73   8/23/73

167+*                          DATA CONTROL BLOCK
168+*

169+RDCB      DC     0F'0' ORIGIN ON WORD BOUNDARY

171+*                          DIRECT ACCESS DEVICE INTERFACE

173+          DC     BL16'0' FDAD,DVTBL
174+          DC     A(0) KEYLE,DEVT,TRBAL

176+*                          COMMON ACCESS METHOD INTERFACE

178+          DC     AL1(0) BUFNO
179+          DC     AL3(1) BUFCB
180+          DC     AL2(0) BUFL
181+          DC     BL2'0100000000000000' DSORG
182+          DC     A(1) IOBAD

184+*                          FOUNDATION EXTENSION

186+          DC     BL1'00000000' BFTEK,BFLN,HIARCHY
187+          DC     AL3(FIN) EODAD
188+          DC     BL1'00000000' RECFM
189+          DC     AL3(0) EXLST

191+*                          FOUNDATION BLOCK

193+          DC     CL8'READ' DDNAME
194+          DC     BL1'00000010' OFLGS
195+          DC     BL1'00000000' IFLG
196+          DC     BL2'0101000000000000' MACR

198+*                          BSAM-BPAM-QSAM INTERFACE

200+          DC     BL1'00000000' RER1
201+          DC     AL3(1) CHECK, GERR, PERR
202+          DC     A(1) SYNAD
203+          DC     H'0' CIND1, CIND2
204+          DC     AL2(0) BLKSIZE
205+          DC     F'0' WCPO, WCPL, OFFSR, OFFSW
206+          DC     A(1) IOBA
207+          DC     AL1(0) NCP
208+          DC     AL3(1) EOBR, EOBAD

210+*                               QSAM INTERFACE

212+          DC     A(1) RECAD
213+          DC     H'0' QSWS
214+          DC     AL2(0) LRECL
215+          DC     BL1'00000000' EROPT
216+          DC     AL3(1) CNTRL
217+          DC     F'0' PRECL
218+          DC     A(1) EOB
219 WDCB1     DCB    DDNAME=WRITE1,MACRF=PM,DSORG=PS,RECFM=FB,LRECL=300        CNVT
```

```
STMT   SOURCE STATEMENT                                          F01FEB73   8/23/73
 221+*                          DATA CONTROL BLOCK
 222+*
 223+WDCB1      DC    OF'0' ORIGIN ON WORD BOUNDARY

 225+*                          DIRECT ACCESS DEVICE INTERFACE

 227+           DC    BL16'0' FDAD,DVTBL
 228+           DC    A(0) KEYLE,DEVT,TRBAL

 230+*                          COMMON ACCESS METHOD INTERFACE

 232+           DC    AL1(0) BUFNO
 233+           DC    AL3(1) BUFCB
 234+           DC    AL2(0) BUFL
 235+           DC    BL2'0100000000000000' DSORG
 236+           DC    A(1) ICBAD

 238+*                          FOUNDATION EXTENSION

 240+           DC    BL1'00000000' BFTEK,BFLN,HIARCHY
 241+           DC    AL3(1) EODAD
 242+           DC    BL1'10010000' RECFM
 243+           DC    AL3(0) EXLST

 245+*                          FOUNDATION BLOCK

 247+           DC    CL8'WRITE1' DDNAME
 248+           DC    BL1'00000010' OFLGS
 249+           DC    BL1'00000000' IFLG
 250+           DC    BL2'0000000001010000' MACR

 252+*                          BSAM-BPAM-QSAM INTERFACE

 254+           DC    BL1'00000000' RER1
 255+           DC    AL3(1) CHECK, GERR, PERR
 256+           DC    A(1) SYNAD
 257+           DC    H'0' CIND1, CIND2
 258+           DC    AL2(0) BLKSIZE
 259+           DC    F'0' WCPO, WCPL, OFFSR, OFFSW
 260+           DC    A(1) IOBA
 261+           DC    AL1(0) NCP
 262+           DC    AL3(1) EOBR, EOBAD

 264+*                               QSAM INTERFACE

 266+           DC    A(1) RECAD
 267+           DC    H'0' QSWS
 268+           DC    AL2(300) LRECL
 269+           DC    BL1'00000000' EROPT
 270+           DC    AL3(1) CNTRL
 271+           DC    F'0' PRECL
 272+           DC    A(1) EOB
 273 WDCB2      DCB   DDNAME=WRITE2,MACRF=PM,DSORG=PS,RECFM=FB,LRECL=300        CNVT
```

```
STMT   SOURCE STATEMENT                                          F01FE873   8/23/73

275+*                          DATA CONTROL BLOCK
276+*
277+WDCB2    DC     OF'0' ORIGIN ON WORD BOUNDARY

279+*                          DIRECT ACCESS DEVICE INTERFACE

281+        DC     BL16'0' FDAD,DVTBL
282+        DC     A(0) KEYLE,DEVT,TRBAL

284+*                          COMMON ACCESS METHOD INTERFACE

286+        DC     AL1(0) BUFNO
287+        DC     AL3(1) BUFCB
288+        DC     AL2(0) BUFL
289+        DC     BL2'0100000000000000' DSORG
290+        DC     A(1) IOBAD

292+*                          FOUNDATION EXTENSION

294+        DC     BL1'00000000' BFTEK,BFLN,HIARCHY
295+        DC     AL3(1) EODAD
296+        DC     BL1'10010000' RECFM
297+        DC     AL3(0) EXLST

299+*                          FOUNDATION BLOCK

301+        DC     CL8'WRITE2' DDNAME
302+        DC     BL1'00000010' OFLGS
303+        DC     BL1'00000000' IFLG
304+        DC     BL2'0000000001010000' MACR

306+*                          BSAM-BPAM-QSAM INTERFACE

308+        DC     BL1'00000000' RER1
309+        DC     AL3(1) CHECK, GERR, PERR
310+        DC     A(1) SYNAD
311+        DC     H'0' CIND1, CIND2
312+        DC     AL2(0) BLKSIZE
313+        DC     F'0' WCPO, WCPL, OFFSR, OFFSW
314+        DC     A(1) IOBA
315+        DC     AL1(0) NCP
316+        DC     AL3(1) EOBR, EOBAD

318+*                              QSAM INTERFACE

320+        DC     A(1) RECAD
321+        DC     H'0' QSWS
322+        DC     AL2(300) LRECL
323+        DC     BL1'00000000' EROPT
324+        DC     AL3(1) CNTRL
325+        DC     F'0' PRECL
326+        DC     A(1) ECB
327 WDCB3   DCB    DDNAME=WRITE3,MACRF=PM,DSORG=PS,RECFM=FB,LRECL=150        CNVT  *
```

```
STMT   SOURCE STATEMENT                                          F01FEB73   8/23/73

 329+*                          DATA CONTROL BLOCK
 330+*
 331+WDCB3     DC     0F'0' ORIGIN ON WORD BOUNDARY

 333+*                          DIRECT ACCESS DEVICE INTERFACE

 335+          DC     BL16'0' FDAD,DVTBL
 336+          DC     A(0) KEYLE,DEVT,TRBAL

 338+*                          COMMON ACCESS METHOD INTERFACE

 340+          DC     AL1(0) BUFNO
 341+          DC     AL3(1) BUFCB
 342+          DC     AL2(0) BUFL
 343+          DC     BL2'0100000000000000' DSORG
 344+          DC     A(1) IOBAD

 346+*                          FOUNDATION EXTENSION

 348+          DC     BL1'00000000' BFTEK,BFLN,HIARCHY
 349+          DC     AL3(1) EODAD
 350+          DC     BL1'10010000' RECFM
 351+          DC     AL3(0) EXLST

 353+*                          FOUNDATION BLOCK

 355+          DC     CL8'WRITE3' DDNAME
 356+          DC     BL1'00000010' OFLGS
 357+          DC     BL1'00000000' IFLG
 358+          DC     BL2'0000000001010000' MACR

 360+*                          BSAM-BPAM-QSAM INTERFACE

 362+          DC     BL1'00000000' RER1
 363+          DC     AL3(1) CHECK, GERR, PERR
 364+          DC     A(1) SYNAD
 365+          DC     H'0' CIND1, CIND2
 366+          DC     AL2(0) BLKSIZE
 367+          DC     F'0' WCPO, WCPL, OFFSR, OFFSW
 368+          DC     A(1) IOBA
 369+          DC     AL1(0) NCP
 370+          DC     AL3(1) EOBR, EOBAD

 372+*                               QSAM INTERFACE

 374+          DC     A(1) RECAD
 375+          DC     H'0' QSWS
 376+          DC     AL2(150) LRECL
 377+          DC     BL1'00000000' EROPT
 378+          DC     AL3(1) CNTRL
 379+          DC     F'0' PRECL
 380+          DC     A(1) EOB
 381 WDCB5     DCB    DDNAME=WRITE5,MACRF=PM,DSORG=PS,RECFM=FB,LRECL=300        CNVT
```

```
STMT   SOURCE STATEMENT                                        F01FEB73   8/23/73

383+*                          DATA CONTROL BLOCK
384+*
385+WDCB5     DC    OF'0' ORIGIN ON WORD BOUNDARY

387+*                          DIRECT ACCESS DEVICE INTERFACE

389+         DC    BL16'0' FDAD,DVTBL
390+         DC    A(0) KEYLE,DEVT,TRBAL

392+*                          COMMON ACCESS METHOD INTERFACE

394+         DC    AL1(0) BUFNO
395+         DC    AL3(1) BUFCB
396+         DC    AL2(0) BUFL
397+         DC    BL2'0100000000000000' DSORG
398+         DC    A(1) IOBAD

400+*                          FOUNDATION EXTENSION

402+         DC    BL1'00000000' BFTEK,BFLN,HIARCHY
403+         DC    AL3(1) EODAD
404+         DC    BL1'10010000' RECFM
405+         DC    AL3(0) EXLST

407+*                          FOUNDATION BLOCK

409+         DC    CL8'WRITE5' DDNAME
410+         DC    BL1'00000010' OFLGS
411+         DC    BL1'00000000' IFLG
412+         DC    BL2'0000000001010000' MACR

414+*                          BSAM-BPAM-QSAM INTERFACE

416+         DC    BL1'00000000' RER1
417+         DC    AL3(1) CHECK, GERR, PERR
418+         DC    A(1) SYNAD
419+         DC    H'0' CIND1, CIND2
420+         DC    AL2(0) BLKSIZE
421+         DC    F'0' WCPO, WCPL, OFFSR, OFFSW
422+         DC    A(1) IOBA
423+         DC    AL1(0) NCP
424+         DC    AL3(1) EOBR, EOBAD

426+*                               QSAM INTERFACE

428+         DC    A(1) RECAD
429+         DC    H'0' QSWS
430+         DC    AL2(300) LRECL
431+         DC    BL1'00000000' EROPT
432+         DC    AL3(1) CNTRL
433+         DC    F'0' PRECL
434+         DC    A(1) EOB
435          END CONVERT                                                CNVT
```

APPENDIX B

SOURCE LISTING OF CONVERSION PROGRAM

```
LEVEL  21                    MAIN                DATE = 73242          18/09/15

C       ILGEO= ILLINOIS GEOGRAPHIC CODE.                                   MAIN
C       ILPLUT= ILLINOIS POLLOUTANT CODE.                                  MAIN
C       ILSITE= ILLINOIS SITE CODE.                                        MAIN
C       STARSI= SAROAD STATE-AREA-SITE CODE.                               MAIN
C       AGPROJ= AGENCY/PROJECT CLASS.                                      MAIN
C       INT= TIME INTERVAL.                                                MAIN
C       DATE= DATEO YYMMDD.                                                MAIN
C       STRTHR= SAMPLING START HOUR.                                       MAIN
C       PRAM= PARAMETER ID.                                                MAIN
C       METH= METHOD ID.                                                   MAIN
C       UNIT= UNIT ID.                                                     MAIN
C       DPLOC= DECIMAL LOCATER.                                            MAIN
C       SIND= SITE INDEX.                                                  MAIN
C       PRMIND= PARAMETER INDEX.                                           MAIN
C       ERR= ERROR.                                                        MAIN
        IMPLICIT INTEGER (A-Z)                                             MAIN
        LOGICAL ERR                                                        MAIN
        COMMON/IO/ INPUT,OUT,DIAG,OPTION                                   MAIN
        COMMON/HEAD/ ILGEO,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,           MAIN
     1          STRTHR,PRAM,METH,UNIT,DPLOC,SIND,PRMIND,ERR                MAIN
        STRTHR=0                                                           MAIN
        OPTION=1                                                           MAIN
        INPUT=10                                                           MAIN
        OUT=20                                                             MAIN
        DIAG=6                                                             MAIN
        CALL REC3                                                          MAIN
        CALL REC2                                                          MAIN
        CALL REC1                                                          MAIN
        CALL REC5                                                          MAIN
        END                                                                MAIN
```

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```
LEVEL  21                    REC3                    DATE = 73242          10/09/15
      SUBROUTINE REC3                                                          REC3
C     24 HOUR SAMPLE.                                                          REC3
      IMPLICIT INTEGER (A-Z)                                                   REC3
      LOGICAL ERR                                                              REC3
      COMMON/IO/ INPUT,OUT,DIAG,OPTION                                         REC3
      COMMON/HEAD/ ILGEO,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,                 REC3
     1        STRTHR,PRAM,METH,UNIT,DPLOC,SIND,PRMIND,ERR                      REC3
      DIMENSION LPRM(4),LMETH(4),LUNIT(4),LDP(4),VAL(4)                        REC3
      DIMENSION DATA(8),PLIND(8)                                               REC3
      DATA NITEMS/8/                                                           REC3
C     NITEMS MUST AGREE WITH DIMENSION OF POLUT,DATA,PLIND                     REC3
      DATA PLIND/ 1,0,3,2,4*0/                                                 REC3
C     PLIND GIVES THE INDEX OF THE POLLUTANT IN THE LIST IN                    REC3
C     THE MOD SUBROUTINE.                                                      REC3
C     POLLUTANTS IN ORDER ARE PART,H2S,COH,SO2,ORG,PH,PB,F                     REC3
      INT=7                                                                    REC3
      ILPLUT=0                                                                 REC3
      ASSIGN 23 TO NO1                                                         REC3
      ASSIGN 39 TO NO2                                                         REC3
      ASSIGN 10 TO NO3                                                         REC3
      IF(OPTION.EQ.0) GO TO 10                                                 REC3
      ASSIGN 21 TO NO1                                                         REC3
      ASSIGN 35 TO NO2                                                         REC3
      ASSIGN 45 TO NO3                                                         REC3
      WRITE(DIAG,5)                                                            REC3
5     FORMAT(' RECORD TYPE 3.')                                                REC3
10    CONTINUE                                                                 REC3
      READ(INPUT,20,END=50) ILGEO,ILSITE,DATE,DATA                             REC3
20    FORMAT(I6,2X,I2,I6,33I4)                                                 REC3
      GO TO NO1,(21,23)                                                        REC3
21    CONTINUE                                                                 REC3
      WRITE(DIAG,22) ILGEO,ILSITE,DATE,DATA                                    REC3
22    FORMAT(10X,I6,I5,9I10)                                                   REC3
23    CONTINUE                                                                 REC3
      CALL HEADER                                                              REC3
      IF(.NOT.ERR) GO TO 28                                                    REC3
      WRITE(DIAG,24) ILGEO,ILPLUT,ILSITE,DATE,DATA                             REC3
24    FORMAT('    3',I10,2I5,I10,10X,8I10/(5X,12I10))                          REC3
      GO TO 10                                                                 REC3
28    CONTINUE                                                                 REC3
      J=0                                                                      REC3
      DO 40 I=1,NITEMS                                                         REC3
      IF(DATA(I).EQ.9999) GO TO 40                                             REC3
      J=J+1                                                                    REC3
      PRMIND=PLIND(I)                                                          REC3
      IF(PRMIND.GT.0) GO TO 31                                                 REC3
      WRITE(DIAG,29) I                                                         REC3
29    FORMAT(' POLLUTANT',I3,' NOT CODED FOR.')                                REC3
```

```
LEVEL  21                    REC3                DATE = 73242          18/09/15

      GO TO 10                                                                REC3
31    CONTINUE                                                                REC3
      CALL MUD                                                                REC3
      IF(ERR) GO TO 10                                                        REC3
      VAL(J)=DATA(I)                                                          REC3
      LPRM(J)=PRAM                                                            REC3
      LMETH(J)=METH                                                           REC3
      LUNIT(J)=UNIT                                                           REC3
      LDP(J)=DPLOC                                                            REC3
      IF(J.LT.4) GO TO 40                                                     REC3
      WRITE(OUT,33) STARSI,AGPROJ,INT,DATE,STRTHR,(LPRM(J),                   REC3
     1        LMETH(J),LUNIT(J),LDP(J),VAL(J),J=1,4)                          REC3
33    FORMAT('2',I9,A3,I1,I6,I2,4(I5,2I2,I1,I4))                              REC3
      GO TO NO2,(35,39)                                                       REC3
35    CONTINUE                                                                REC3
      WRITE(DIAG,37) STARSI,AGPROJ,INT,DATE,STRTHR,(LPRM(J),                  REC3
     1        LMETH(J),LUNIT(J),LDP(J),VAL(J),J=1,4)                          REC3
37    FORMAT(5X,'2',I9,A3,I1,I6,I2,4(I5,2I2,I1,I4))                           REC3
39    CONTINUE                                                                REC3
      J=0                                                                     REC3
40    CONTINUE                                                                REC3
      IF(J.GT.0) WRITE(OUT,33) STARSI,AGPROJ,INT,DATE,STRTHR,                 REC3
     1        (LPRM(I),LMETH(I),LUNIT(I),LDP(I),VAL(I),I=1,J)                 REC3
      GO TO NO3,(10,45)                                                       REC3
45    CONTINUE                                                                REC3
      IF(J.GT.0) WRITE(DIAG,37) STARSI,AGPROJ,INT,DATE,STRTHR,                REC3
     1        (LPRM(I),LMETH(I),LUNIT(I),LDP(I),VAL(I),I=1,J)                 REC3
      GO TO 10                                                                REC3
50    CONTINUE                                                                REC3
      END FILE OUT                                                            REC3
      RETURN                                                                  REC3
      END                                                                     REC3
```

```
LEVEL  21                    REC2                    DATE = 73242          18/09/15

      SUBROUTINE REC2                                                          REC2
C     HOURLY DATA.                                                             REC2
      IMPLICIT INTEGER (A-Z)                                                   REC2
      LOGICAL ERR                                                              REC2
      COMMON/IO/ INPUT,OUT,DIAG,OPTION                                         REC2
      COMMON/HEAD/ ILGEO,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,                 REC2
     1        STRTHR,PRAM,METH,UNIT,DPLOC,SIND,PRMIND,ERR                      REC2
      DIMENSION DATA(24)                                                       REC2
      DATA HOUR12/12/                                                          REC2
      INT=1                                                                    REC2
      ASSIGN 10 TO NO2                                                         REC2
      IF(OPTION.EQ.0) GO TO 10                                                 REC2
      ASSIGN 35 TO NO2                                                         REC2
      WRITE (DIAG,5)                                                           REC2
5     FORMAT('1RECORD TYPE 2.')                                                REC2
10    CONTINUE                                                                 REC2
      READ(INPUT,20,END=40) ILGEO,ILPLUT,ILSITE,DATE,DATA                      REC2
20    FORMAT(I6,2I2,I6,47(2X,I4))                                              REC2
      CALL HEADER                                                              REC2
C     GET SAROAD CODE FOR POLLUTANT.                                           REC2
      CALL PLUTNT                                                              REC2
      IF(.NOT.ERR) GO TO 28                                                    REC2
      WRITE(DIAG,24) ILGEO,ILPLUT,ILSITE,DATE,DATA                             REC2
24    FORMAT('    2',I10,2I5,I10,10X,8I10/(5X,12I10))                          REC2
      GO TO 10                                                                 REC2
28    CONTINUE                                                                 REC2
      WRITE(OUT,30) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,UNIT,              REC2
     1        DPLOC,(DATA(J),J=1,12),STARSI,AGPROJ,INT,DATE,                   REC2
     2        HOUR12,PRAM,METH,UNIT,DPLOC,(DATA(J),J=13,24)                    REC2
30    FORMAT(('1',I9,A3,I1,I6,I2,I5,2I2,I1,12I4))                              REC2
      GO TO NO2,(10,35)                                                        REC2
35    CONTINUE                                                                 REC2
      WRITE(DIAG,36) ILGEO,ILPLUT,ILSITE,DATE,DATA                             REC2
36    FORMAT(10X,I6,2I5,13I8/34X,12I8)                                         REC2
      WRITE(DIAG,37) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,UNIT,             REC2
     1        DPLOC,(DATA(J),J=1,12),STARSI,AGPROJ,INT,DATE,                   REC2
     2        HOUR12,PRAM,METH,UNIT,DPLOC,(DATA(J),J=13,24)                    REC2
37    FORMAT((5X,'1',I9,A3,I1,I6,I2,I5,2I2,I1,12I4))                           REC2
      GO TO 10                                                                 REC2
40    CONTINUE                                                                 REC2
      END FILE OUT                                                             REC2
      RETURN                                                                   REC2
      END                                                                      REC2
```

```
LEVEL  21                    REC1                DATE = 73242          18/09/15

      SUBROUTINE REC1                                                    REC1
C     2 HOUR SAMPLES.                                                    REC1
      IMPLICIT INTEGER (A-Z)                                             REC1
      LOGICAL ERR                                                        REC1
      COMMON/IO/ INPUT,OUT,DIAG,OPTION                                   REC1
      COMMON/HEAD/ ILGEO,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,           REC1
     1        STRTHR,PRAM,METH,UNIT,DPLOC,SIND,PRMIND,ERR                 REC1
      DIMENSION DATA(12)                                                 REC1
      INT=2                                                              REC1
      ASSIGN 10 TO NO2                                                   REC1
      IF(OPTION.EQ.0) GO TO 10                                           REC1
      ASSIGN 35 TO NO2                                                   REC1
      WRITE (DIAG,5)                                                     REC1
5     FORMAT('1RECORD TYPE 1.')                                          REC1
10    CONTINUE                                                           REC1
      READ(INPUT,20,END=40) ILGEO,ILPLUT,ILSITE,DATE,DATA                REC1
C     PICK UP THE EVEN VALUES OF DATA.                                   REC1
20    FORMAT(I6,2I2,I6,23(8X,I4))                                        REC1
      CALL HEADER                                                        REC1
C     GET SAROAD CODE FOR POLLUTANT.                                     REC1
      CALL PLUTNT                                                        REC1
      IF(.NOT.ERR) GO TO 28                                              REC1
      WRITE(DIAG,24) ILGEO,ILPLUT,ILSITE,DATE,DATA                       REC1
24    FORMAT('     1',I10,2I5,I10,10X,8I10/(5X,12I10))                   REC1
      GO TO 10                                                           REC1
28    CONTINUE                                                           REC1
      WRITE(OUT,30) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,             REC1
     1        UNIT,DPLOC,DATA                                             REC1
30    FORMAT('1',I9,A3,I1,I6,I2,I5,2I2,I1,12I4)                          REC1
      GO TO NO2,(10,35)                                                  REC1
35    CONTINUE                                                           REC1
      WRITE(DIAG,36) ILGEO,ILPLUT,ILSITE,DATE,DATA                       REC1
36    FORMAT(10X,I10,2I5,13I7)                                           REC1
      WRITE(DIAG,37) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,            REC1
     1        UNIT,DPLOC,DATA                                             REC1
37    FORMAT(5X,'1',I9,A3,I1,I6,I2,I5,2I2,I1,12I4)                       REC1
      GO TO 10                                                           REC1
40    CONTINUE                                                           REC1
      END FILE OUT                                                       REC1
      RETURN                                                             REC1
      END                                                                REC1
```

```
; LEVEL  21                    REC5                DATE = 73242          18/09/15
      SUBROUTINE REC5                                                          REC5
C     METEOROLOGICAL DATA.                                                     REC5
      IMPLICIT INTEGER (A-Z)                                                   REC5
      LOGICAL ERR                                                              REC5
      COMMON/IO/ INPUT,OUT,DIAG,OPTION                                         REC5
      COMMON/HEAD/ ILGEO,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,                 REC5
     1        STRTHR,PRAM,METH,UNIT,DPLOC,SIND,PRMIND,ERR                      REC5
      DIMENSION DIR(24),SPEED(24)                                              REC5
      DATA HOUR12/12/                                                          REC5
      INT=1                                                                    REC5
      ILPLUT=0                                                                 REC5
      ASSIGN 80 TO NO1                                                         REC5
      ASSIGN 10 TO NO2                                                         REC5
      IF(OPTION.EQ.0) GO TO 10                                                 REC5
      ASSIGN 50 TO NO1                                                         REC5
      ASSIGN 90 TO NO2                                                         REC5
      WRITE(DIAG,5)                                                            REC5
5     FORMAT('1RECORD TYPE 5.')                                                REC5
10    CONTINUE                                                                 REC5
      READ(INPUT,20,END=100) ILGEO,ILSITE,DATE,(DIR(I),SPEED(I),I=1,24)        REC5
20    FORMAT(I6,2X,I2,I6,24(I4,I2))                                            REC5
      CALL HEADER                                                              REC5
      IF(.NOT.ERR) GO TO 28                                                    REC5
      WRITE(DIAG,24) ILGEO,ILPLUT,ILSITE,DATE,(DIR(I),SPEED(I),I=1,24)         REC5
24    FORMAT('     5',I10,2I5,I10,10X,16I5/(5X,24I5))                          REC5
      GO TO 10                                                                 REC5
28    CONTINUE                                                                 REC5
C     WIND DIRECTION.                                                          REC5
      PRMIND=5                                                                 REC5
      CALL MOD                                                                 REC5
      DO 30 I=1,24                                                             REC5
      IF(DIR(I).EQ.999) DIR(I)=0                                               REC5
      IF(DIR(I).EQ.500) DIR(I)=9999                                            REC5
30    CONTINUE                                                                 REC5
      WRITE(OUT,40) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,                   REC5
     1        UNIT,DPLOC,(DIR(I),I=1,12),STARSI,AGPROJ,INT,DATE,HOUR12,        REC5
     2        PRAM,METH,UNIT,DPLOC,(DIR(I),I=13,24)                            REC5
40    FORMAT(('1',I9,A3,I1,I6,I2,I5,2I2,I1,12I4))                              REC5
      GO TO NO1,(50,80)                                                        REC5
50    CONTINUE                                                                 REC5
      WRITE(DIAG,60) ILGEO,ILSITE,DATE,(DIR(I),SPEED(I),I=1,24)                REC5
60    FORMAT(10X,I6,2X,I2,I8,12(I4,I2)/28X,12(I4,I2))                          REC5
      WRITE(DIAG,70) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,                  REC5
     1        UNIT,DPLOC,(DIR(I),I=1,12),STARSI,AGPROJ,INT,DATE,HOUR12,        REC5
     2        PRAM,METH,UNIT,DPLOC,(DIR(I),I=13,24)                            REC5
70    FORMAT((5X,'1',I9,A3,I1,I6,I2,I5,2I2,I1,12I4))                           REC5
80    CONTINUE                                                                 REC5
C     PROCESS SPEED PARAMETERS.                                                REC5
```

```
 LEVEL  21                    REC5                DATE = 73242          18/09/15

      PRMIND=4                                                                  REC5
      CALL MUD                                                                  REC5
      WRITE(OUT,40) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,UNIT,               REC5
     1        DPLOC,(SPEED(I),I=1,12),STARSI,AGPROJ,INT,DATE,HOUR12,            REC5
     2        PRAM,METH,UNIT,DPLOC,(SPEED(I),I=13,24)                           REC5
      GO TO NO2,(10,90)                                                         REC5
 90   CONTINUE                                                                  REC5
      WRITE(DIAG,70) STARSI,AGPROJ,INT,DATE,STRTHR,PRAM,METH,UNIT,              REC5
     1        DPLOC,(SPEED(I),I=1,12),STARSI,AGPROJ,INT,DATE,HOUR12,            REC5
     2        PRAM,METH,UNIT,DPLOC,(SPEED(I),I=13,24)                           REC5
      GO TO 10                                                                  REC5
 100  CONTINUE                                                                  REC5
      END FILE OUT                                                              REC5
      RETURN                                                                    REC5
      END                                                                       REC5
```

```
      SUBROUTINE HEADER                                                 HEDR
      IMPLICIT INTEGER (A-Z)                                            HEDR
      LOGICAL ERR                                                       HEDR
      COMMON/IO/ INPUT,OUT,DIAG,OPTION                                  HEDR
      COMMON/HEAD/ ILGFD,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,          HEDR
     1       STRTHR,PRAM,METH,UNIT,DPLOC,SIND,PRMIND,ERR                HEDR
      DIMENSION LCTABL(2,163),AGNPRJ(163),L1(2,54),L2(2,54),L3(2,2)     HEDR
C     L1, L2, L3 ARE DUMMY ARRAYS USED TO INITIALIZE LCTABL.            HEDR
      EQUIVALENCE (LCTABL(1,54),L1(1)),(LCTABL(1,108),L2(1))            HEDR
      EQUIVALENCE (LCTABL(1,162),L3(1))                                 HEDR
C     NSITES MUST AGREE WITH THE DIMENSIONS OF LCTABL,AGNPRJ.           HEDR
      DATA NSITES/163/                                                  HEDR
      DATA LCTABL/    .       01901001,141780001, 10103001,146680001,   HEDR
     1   10103002,146680006, 10103003,146680005, 01500608,141540001,   HEDR
     2   01601201,141540002, 01601202,141540015, 01602410,140500001,   HEDR
     3   01603913,140780001, 01604502,141240003, 01604515,141240001,   HEDR
     4   01605107,141340001, 01606316,141840001, 01608101,142360001,   HEDR
     5   01608714,142520001, 01609604,142520001, 01610201,142490001,   HEDR
     6   01611112,143180001, 01612306,143420001, 01617401,141540016,   HEDR
     7   01601202,141540015, 01617402,141540017, 01618319,144960001,   HEDR
     8   01619211,145080001, 01619501,145320001, 01620102,145540001,   HEDR
     9   01622517,145740001, 01623109,145860001, 01623401,145900001,   HEDR
     1   01626105,146540001, 01626401,146560001, 01628806,147160003,   HEDR
     2   01628807,147160004, 01633003,148360001, 01633301,148420001,   HEDR
     3   01641401,140380001, 01647418,146000001, 01660001,141220003,   HEDR
     4   01660002,141220004, 01660003,141220011, 01660004,141220012,   HEDR
     5   01660005,141220005, 01660006,141220013, 01660007,141220006,   HEDR
     6   01660008,141220014, 01660009,141220015, 01660010,141220007,   HEDR
     7   01660011,141220009, 01660012,141220016, 01660013,141220017,   HEDR
     8   01660014,141220010, 01660015,141220018, 01660016,141220019/   HEDR
      DATA L1/01660017,14122 0025, 01660018,141220020,01660019,141220028,HEDR
     1   01660020,141220021, 01660030,141220029, 01660031,141220022,   HEDR
     2   01660032,141220032, 01660033,141220030, 01660034,141220031,   HEDR
     3   01660035,141220034, 01660050,141220033, 02200501,140060001,   HEDR
     4   02203002,141940001, 02203501,142300001, 02206501,145480001,   HEDR
     5   02209001,148080002, 02210501,148220002, 02248301,148080001,   HEDR
     6   04500501,140220001, 04543801,142260001, 04602001,140580001,   HEDR
     7   04907501,144020001, 04912501,145620002, 04919001,148020001,   HEDR
     8   04945401,144000001, 05601001,141020001, 05601501,141680002,   HEDR
     9   09903011,141640001, 01660050,141220033, 09904501,143760001,   HEDR
     1   09904506,143760003, 09904508,143760002, 09904510,143760004,   HEDR
     2   09904512,14       , 09904513,14       , 09904550,143760005,   HEDR
     3   09905005,144380002, 09906002,148320006, 09906503,148320005,   HEDR
     4   09908507,148320004, 09909004,146760002, 09911009,148380001,   HEDR
     5   08102501,142080001, 08104501,145120001, 08106501,146700002,   HEDR
     6   09805001,147400001, 00603001,140680001, 07801001,146420005,   HEDR
     7   07801002,146420004, 02902501,140920001, 04802001,142740001,   HEDR
     8   07206501,146080001, 07206502,146080023, 07206506,146080    /   HEDR
```

```
6 LEVEL  21                    HEADER                    DATE = 73242          18/09/15

      DATA L2/09904550,143760005, 09002001,142100002,09002003,142100003,HEDR
     1   09006001,146060002, 01001001,141140001, 05702001,140480001,     HEDR
     2   00106502,146440002, 09002003,142100003, 00106503,146440003,     HEDR
     3   05801501,141740004, 05801503,141740003, 05801504,141740002,     HEDR
     4   06502001,146170001, 08412050,147280003, 01403001,140880001,     HEDR
     5   06001002,140160004, 06002501,142180002, 06004001,142960006,     HEDR
     6   06004003,142960005, 06004005,142960007, 06004006,142960008,     HEDR
     7   06004007,142960009, 06004008,142960010, 06004009,142960011,     HEDR
     8   06004010,14       , 06001501,147760002, 06011503,148520007,     HEDR
     9   06042801,141500002, 06700501,141520001, 08201001,140320001,     HEDR
     1   08204501,142120002, 08204550,142120009, 03901501,140840001,     HEDR
     2   06401506,145060004, 06011501,148520007, 06011503,148520007,     HEDR
     3   01604501,141240001. 00603004,140580   , 00603005,140680   ,     HEDR
     4   03404001,143075   , 07206505,146080   , 09006002,146060   ,     HEDR
     5   08412001,147280002, 06011501,148520002, 08204504,142120009,     HEDR
     6   06401505,145060001, 01603913,147080001, 01604515,141240001,     HEDR
     7   01612306,143220001, 01628816,147160   , 09904501,143760001,     HEDR
     8   01606316,141840001, 08204505,142120008, 05709001,145560001/     HEDR
      DATA L3/05801505,141740005, 07206507,146080024/                    HEDR
      DATA AGNPRJ/ 4*'F01','G01',2*'H01',2*'G01','F01',3*'G01','F01',    HEDR
     1        2*'G01','F01',2*'G01',3*'H01',2*'G01','H01',5*'G01',       HEDR
     2        3*'F01','G01',2*'F01','G01',25*'H01','H03',19*'F01',       HEDR
     3        6*'G01','F01','G01',4*'F01','G01',7*'F01','J02',           HEDR
     4        7*'F01','J01',10*'F01','F03',4*'F01',6*'H01',15*'F01',     HEDR
     5        'J05',5*'F01',4*'G01','F01','G01',4*'F01'/                 HEDR
      KEY=100*ILGEO+ILSITE                                              HEDR
      DO 10 SIND=1,NSITES                                               HEDR
      IF(KEY.EQ.LCTABL(1,SIND)) GO TO 30                                HEDR
10    CONTINUE                                                          HEDR
      WRITE(DIAG,20)                                                    HEDR
20    FORMAT(' SITE NOT LOCATED.')                                      HEDR
      ERR=.TRUE.                                                        HEDR
      RETURN                                                            HEDR
30    CONTINUE                                                          HEDR
      STARSI=LCTABL(2,SIND)                                             HEDR
      AGPROJ=AGNPRJ(SIND)                                               HEDR
      ERR=.FALSE.                                                       HEDR
      RETURN                                                            HEDR
      END                                                               HEDR
```

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```
      SUBROUTINE PLUTNT                                                 PLUT
C     PLUTNT FINDS THE SAROAD CODE FOR A GIVEN ILPLUT. THEN IN THE      PLUT
C     MUD SECTION, IT DETERMINES THE METHOD, UNITS, AND DECIMAL PLACE.  PLUT
      IMPLICIT INTEGER (A-Z)                                            PLUT
      LOGICAL ERR                                                       PLUT
      COMMON/IO/ INPUT,OUT,DIAG,OPTION                                  PLUT
      COMMON/HEAD/ ILGEO,ILPLUT,ILSITE,STARSI,AGPROJ,INT,DATE,          PLUT
     1        STRTHR,PRAM,METH,UNIT,DPLCC,SIND,PRMIND,ERR               PLUT
      DIMENSION M(163,7),U(163,7),D(163,7),PLTABL(2,7)                  PLUT
C     M = METHOD, U = UNITS, D = DECIMAL PLACE.                         PLUT
C     1ST DIMENSION OF M,U, AND D MUST = NO. OF SITES. 2ND DIMENSION    PLUT
C     = NO. OF POLLUTANTS.                                              PLUT
C     POLLUTANT ORDER IS PART,SO2,COH,WS,WD,CARBON MONOXIDE, AND TOX.   PLUT
      DIMENSION CHNGES(5,1)                                             PLUT
C     CHNGES IS AN ARRAY FOR SITES WHICH CHANGE THEIR WAYS. 2ND         PLUT
C     DIMENSION = NO. OF CHANGES  1ST DIMENSION CONTAINS METHOD, UNITS, PLUT
C     DP, DATE, AND A POINTER TO THE NEXT CHANGE FOR THAT SITE AND      PLUT
C     POLLUTANT CODE IF THERE IS ONE.                                   PLUT
      DATA NPOLS,NCHNGS/ 7,0/                                           PLUT
C     NPOLS MUST = DIMENSION OF PLTABL. NCHNGS = DIMENSION OF CHNGES.   PLUT
      DATA M/163*91, 4*11,91,2*13,12*91,3*13,8*91,3*11,48*91,16*11,     PLUT
     1        5*91,4*13,41*11,4*13,2*11,4*13,6*11,                      PLUT
     2        163*81, 489*11,163*14/                                    PLUT
      DATA U/ 163*1, 163*7, 163*9, 163*12, 163*14, 163*7, 163*7/        PLUT
      DATA D/ 163*0, 163*3, 163*2, 163*0, 163*0, 163*2, 163*3/          PLUT
      DATA PLTABL/ 42,11101, 32,42401, 10,11201, 81,61101,              PLUT
     1        82,61102, 50,42101, 53,44101/                             PLUT
C     FIND SAROAD CODE FOR ILPLUT.                                      PLUT
      DO 10 PRMIND=1,NPOLS                                              PLUT
      IF(ILPLUT.EQ.PLTABL(1,PRMIND)) GO TO 30                           PLUT
10    CONTINUE                                                          PLUT
      WRITE(DIAG,20) ILPLUT                                             PLUT
20    FORMAT(' POLLUTANT CODE',I3,' NOT FOUND.')                        PLUT
      ERR=.TRUE.                                                        PLUT
      RETURN                                                            PLUT
30    CONTINUE                                                          PLUT
      IF(ERR) RETURN                                                    PLUT
C     NOW COMES THE DIRTY WORK.                                         PLUT
      ENTRY MUD                                                         PLUT
      PRAM=PLTABL(2,PRMIND)                                             PLUT
      METH=M(SIND,PRMIND)                                               PLUT
C     CHECK FOR METHOD CHANGE.                                          PLUT
      IF(METH.GT.0) GO TO 80                                            PLUT
      PT=-METH                                                          PLUT
40    CONTINUE                                                          PLUT
      IF(DATE.LT.CHNGES(4,PT)) GO TO 70                                 PLUT
C     METHOD HAS CHANGED AGAIN.                                         PLUT
      PT=CHNGES(5,PT)                                                   PLUT
```

```
      IF(PT.LT.NCHNGS) GO TO 40                                          PLUT
      WRITE (DIAG,50)                                                    PLUT
50    FORMAT(' METHOD CHANGE ERROR. POINTER EXCEEDS NO. OF CHANGES.')    PLUT
      ERR=.TRUE.                                                         PLUT
      RETURN                                                             PLUT
70    CONTINUE                                                           PLUT
      METH=CHNGES(1,PT)                                                  PLUT
      UNIT=CHNGES(2,PT)                                                  PLUT
      DPLOC=CHNGES(3,PT)                                                 PLUT
      RETURN                                                             PLUT
80    CONTINUE                                                           PLUT
      UNIT=U(SIND,PRMIND)                                                PLUT
      DPLOC=D(SIND,PRMIND)                                               PLUT
      RETURN                                                             PLUT
      END                                                                PLUT
```

APPENDIX C

JCL REQUIREMENTS

The following JCL statements applied when programs PREPROCESSOR and CONVERSION were compiled and executed for the test sample case. Since JCL is strongly dependent on both machine and facility, all necessary changes should be exercised where appropriate by consultation with the systems people at any new facility.

C-1. ASSEMBLE-AND-GO FOR THE PREPROCESSOR PROGRAM

JCL statements used in the test case are given below:

```
//          Job Card
// EXEC ASMFCG
//ASM.SYSIN DD *
  [Source Deck]
//GØ.READ DD DSN=ILLINØIS,UNIT=2400,
//   VØL=SER=PH4875
//GØ.WRITE1 DD DSN=ILLF3,UNIT=2400,
//   VØL=SER=PH3022,LABEL=(3,SL),
//   DCB=(BLKSIZE=3000,DEN=2)
//GØ.WRITE2 DD DSN=ILLF2,UNIT=2400,
//   VØL=REF=*.WRITE1,LABEL=(2,SL),
//   DCB=(BLKSIZE=3000,DEN=2)
//GØ.WRITE3 DD DSN=ILLF1,UNIT=2400,
//   VØL=REF=*.WRITE1,LABEL=(1,SL),
//   DCB=(BLKSIZE=3000,DEN=2)
//GØ.WRITE4 DD DSN=ILLF4,UNIT=2400,
//   VØL=REF=*.WRITE1,LABEL=(4,SL),
//   DCB=(BLKSIZE=3000,DEN=2)
/*
```

C-2. COMPILE-AND-GO FOR THE CONVERSION PROGRAM

The following JCL statements are used:

```
//          Job Card
// EXEC FØRTGCG
//FØRT.SYSIN DD *
  [Source Deck]
//GØ.FT10F001 DD DSN=ILLF1,UNIT=2400,
//   VØL=SER=PH3022
//GØ.FT10F002 DD DSN=ILLF2,UNIT=2400,
//   VØL=REF=*.FT10F001,LABEL=(2,SL)
//GØ.FT10F003 DD DSN=ILLF3,UNIT=2400,
//   VØL=REF=*.FT10F001,LABEL=(3,SL)
//GØ.FT10F004 DD DSN=ILLF4,UNIT=2400,
//   VØL=REF=*.FT10F001,LABEL=(4,SL)
//GØ.FT20F001 DD UNIT=2400,VØL=SER=PH1618,
//   LABEL=(1,NL),DCB=(LRECL=80,DEN=2,BLKSIZE=3200)
//GØ.FT20F002 DD UNIT=2400,VØL=REF=*.FT20F001,
//   LABEL=(2,NL),DCB=(LRECL=80,DEN=2,BLKSIZE=3200)
//GØ.FT20F003 DD UNIT=2400,VØL=REF=*.FT20F001,
//   LABEL=(3,NL),DCB=(LRECL=80,DEN=2,BLKSIZE=3200)
//GØ.FT20F004 DD UNIT=2400,VØL=REF=*.FT20F001,
//   LABEL=(4,NL),DCB=(LRECL=80,DEN=2,BLKSIZE=3200)
/*
```

The program reads the preprocessed tape on unit 10, hence FT10F00X. Unit 20 describes the output tape files, hence FT20F00X. It is imperative that consistency in the JCL between the CONVERSION's FT10F00X and the PREPROCESSOR's WRITEX be maintained, since they refer to one and the same set of files.

APPENDIX D

PROGRAM ADDITIONS AND MODIFICATIONS

In keeping with the need to have the program flexible enough to accommodate minor revisions in format and/or additional data items, this appendix describes the changes necessary to effect some of the anticipated revisions. The changes include site addition, pollutant addition, coding a new pollutant in record type No. 3, and coding a change in method data.

Generally, only three subroutines in CONVERSION are affected. These are REC3, HEADER and PLUTNT. The PREPROCESSOR is not affected.

D-1. SITE ADDITIONS

There are two arrays in subroutine HEADER that need to be expanded. The first is LCTABL which is a 2XNSITES array where NSITES is the total number of sites. It contains the Illinois geographic and site codes for all of the sites and the corresponding SAROAD codes for state, area, and site. These values are paired as follows:

1st value = 100* (Illinois geographic code) + Illinois site code

2nd value = the corresponding nine digit SAROAD code for state, area, and site.

To add sites, change the dimensions of LCTABL so that the second dimension agrees with the new number of sites. In addition, the dimension of a dummy variable L3, which is equivalent to the last part of the LCTABL array, must be increased by the number of new sites (see example). The new pairs of numbers (Illinois codes and SAROAD codes) should then be placed at the end of the DATA statement for LCTABL.

AGNPROJ is an array containing the agency/project information. Its dimension must also equal NSITES. New site information should go on at the end of the DATA statement for AGNPROJ in the position corresponding to the site position in LCTABL.

The value of NSITES in subroutine HEADER must agree with the new number of sites.

For site additions, three variables in subroutine PLUTNT are affected. These are arrays M, U, and D, and stand for method, units, and decimal place, respectively. Each of these arrays is an NSITESXNPOLS dimensionsal array where NSITES is again the number of sites and NPOLS is the number of pollutants.

In each array, all (i.e., the total #) of sites vs the first pollutant are listed, then all of the sites again vs the second pollutant, and so on, until all of the pollutants are exhausted. For example, with four sites and two pollutants, the data for methods would be listed in the order M(1,1), M(2,1), M(3,1), M(4,1), M(1,2), M(2,2), M(3,2), M(4,2), and similarly for the arrays U and D. Adding a site means adding 3*NPOLS pieces of data, one at the end of each pollutant section in each of the method, units, and decimal point variables.

To add a site, the first dimension of each array must be changed to agree with the new number of sites. Next, since there are NPOLS columns, data must be added to each column for each new site. In the DATA statement for these arrays, each pollutant column is separated by a space from adjacent columns. The ordering of the pollutant species is as follows: particulates, SO_2, COH, WS, WD, CO, TOX.

As an example, suppose we wish to add a new site with characteristics as listed in Table D-1. In HEADER, the relevant changes are listed below:

Old Card	New Card
DIMENSION LCTABL(2,162), AGNPROJ(2,162), L3(2,1)	DIMENSION LCTABL(2,163), AGNPROJ(2,163), L3(2,2)
DATA NSITES/162/	DATA NSITES/163/
DATA L3/05801505, 141740005/	DATA L3/05801505, 14740005, 00206507, 146080024/

TABLE D-1

SAMPLE CODES OF NEW SITE TO BE INCLUDED

IEPA Format				SAROAD Format					
Geo. Code	Site	Location	Pollutant	Site Code Prefix 4	Agency/ Project	Parameter Code	Method	Units	Decimal Point
072065	07	Peoria	COH	6080 024	F 01	11201	81	09	2
			SO_2			42401	11	07	3

Old Card	New Card
DATA AGNPROJ/	DATA AGNPROJ/ .....
1 2 3 4 continuation cards	1 2 3 4 continuation cards
5 'J05',5*'F01',4*'G01','F01', 'G01',3*'F01'/	5 'J05',5*'F01',4*'G01','F01','G01', 4*'F01'/

In the subroutine PLUTNT, the relevant changes are:

Old Card	New Card
DIMENSION M(162,7), U(162,7), D(162,7)	DIMENSION M(163,7), U(163,7), D(163,7)
DATA M/162*91,4*11,91,2*13,12*91, 3*13,8*91,3*11,48*91,16*11,5*91, 4*13,41*11,4*13,2*11,4*13,5*11, 162*81,486*11,162*14/	DATA M/163*91,4*11,91,2*13,12*91, 3*13,8*91,3*11,48*91,16*11,5*91, 4*13,41*11,4*13,2*11,4*13,6*11, 163*81,489*11,163*14/
DATA U/162*1,162*7,162*9,162*12, 162*14,162*7,162*7/	DATA U/163*1,163*7,163*9,163*12, 163*14,163*7,163*7/
DATA D/162*0,162*3,162*2,162*0, 162*0,162*2,162*3/	DATA D/163*0,163*3,163*2,163*0, 163*0,163*2,163*3/

Notice that although the added site only samples two pollutants, placeholding codes for the other pollutants must be added so that future data items will be aligned properly.

D-2. POLLUTANT ADDITIONS

For pollutant additions, subroutine PLUTNT is affected. First, the variable NPOLS, which stands for the number of pollutants, must be changed to agree with the new number. The arrays, M, U, and D, which were described in the previous section, must have their second dimension changed to equal NPOLS. Next, a new column of data containing NSITES pieces of information corresponding to each added pollutant must be added to each of the arrays M, U, and D.

PLTABL is an array dimensioned 2XNPOLS, and contains first an Illinois pollutant code, and then a corresponding SAROAD pollutant code in pairs.

Its second dimension must equal NPOLS. The additional pairs (of Illinois and SAROAD codes) must go to the end of the DATA statement for PLTABL.

As an example, suppose there currently exist six pollutants, and a seventh, TOX, is to be incorporated. The following information is extracted from the SAROAD manual [4]:

Illinois Pollutant Code = 53
SAROAD parameter code = 44101
Method code = 14
Units code = 7
Decimal places for all sites meaning TOX = 3

The necessary changes in PLUTNT are:

Old Card	New Card
DIMENSION M(163,6),U(163,6),D(163,6), PLTABL(2,6)	DIMENSION M(163,7),U(163,7),U(163,7), PLTABL(2,7)
DATA NPOLS,NCHNGS/6,0/	DATA NPOLS,NCHNGS/7,0/
DATA M/163*91,....,489*11/	DATA M/163*91,....,489*11,163*14/
DATA U/163*1,....,163*7/	DATA U/163*1,....,163*7,163*7/
DATA D/163*0,....,163*2/	DATA D/163*0,....,163*2,163*3/
DATA PLTABL/42,11101,32,42401,...., 50,42101/	DATA PLTABL/42,11101,32,42401,50, 42101,53,44101/

Even though all sites do not measure TOX, dummy values must be placed in the seventh column for proper data alignment.

D-3. CODING A POLLUTANT IN RECORD TYPE 3

Subroutines REC3 and PLUTNT are affected.

Record type 3 can contain several pollutants on a single record. There are no pollutant codes given because the location of data in the record determines which pollutant is associated with it. The subroutine PLUTNT determines the correct SAROAD codes for the pollutant, method, and decimal place. However, some of the pollutants possible in record 3 have not been

coded into the tables in PLUTNT because there was no information available on them and they were not expected to appear on any input tapes. Should one appear without additional coding, the program will write an error message. To code for this previously unused pollutant, the subroutine PLUTNT must be changed as described in the last section. In addition, the array PLIND in SUBROUTINE REC3 must be modified. PLIND gives the index of a record type 3 pollutant in the list in PLUTNT. This eliminates the requirement of PLUTNT locating the pollutant in its tables. If one of the pollutants in record 3 is added to the arrays in PLUTNT, then the corresponding item in PLIND should be changed to identify the pollutant index.

D-4. CODING A CHANGE IN METHOD

Subroutine PLUTNT must be modified to accommodate a change in methods code.

CHNGES is a 5XNCHNGS array which contains method change information. NCHNGS equals the second dimension of CHNGES. The first dimension contains (1) method, (2) units, (3) decimal point, (4) date of change to new method (set to 999999 if this is the last change for this site and pollutant), and (5) a pointer to the next change for the particular site and pollutant if there is one. The second dimension initially had a dummy value of one.

To code a change in method, the dimension of CHNGES must be increased to accommodate the change. If this is the first change for this site-pollutant combination, then two columns must be provided for in CHNGES. The first column will contain five pieces of information: (1) the first method, (2) the first units, (3) the first decimal place locater, (4) the date of change to the new method, and (5) the index of the column in CHNGES which provides the second method, units, and decimal place information. The fourth element of this second column should be set to 999999 so that there will be no doubt that this is the final change. The program will compare this number with the date of the sample to see if the sample was taken after this change date. The second column's fifth element, the pointer to the further changes, can be set to anything, but to insure proper correspondence of data values, ought to be set to a finite value.

The array M will indicate that a change in method has occurred. Instead of the method code for the site-pollutant in question, the negative of the index of the column in the CHNGES array should be present.

If this is not the first change for this site-pollutant, increase the dimension of CHNGES by one. Put the date of change into CHNGES(4,I) where I is the index of what previously had been the last change for that site-pollutant. In CHNGES(5,I), which is the pointer value, put the index of CHNGES which pinpoints the final change. Then at the column of CHNGES pointed to by this index (which should equal the dimension of CHNGES unless more than one site-pollutant combination is being changed) place the values for method, units, and decimal place. Also, put in 999999 for the date and anything for the pointer. To insure proper allocation of data within the array, all elements in the array should be properly accounted.

As an example of coding a change in method, suppose that site 01 in DePue (006030,140680001) changed its method for measuring particulates from 91 to 77 on January 1, 1973 and that this is the first change ever to be coded. Then the set of old and new DATA statements will appear as follows:

Old Statement	New Statement
DATA NCHNGS/0	DATA NCHNGS/2/
DATA M/163*91,....	DATA M/99*91,-1,63*91,....
DIMENSION CHNGES(5,1)....	DIMENSION CHNGES(5,2)....
	DATA CHNGES/91,1,0,730101,2,77,1, 0,999999,0/

NCHNGS must now agree with the dimension of CHNGES. The -1 at the 100th place in the array M is the negative of the pointer to the first method. It points to the first column of CHNGES. The DATA statement for CHNGES gives the methods, units, decimal places, dates, and pointers to additional changes for that site and pollutant code. The value 2 at CHNGES(5,1) is the pointer to the new method, units and decimal place which goes in the second column of CHNGES. CHNGES(4,2) gives the date of a further change. Since there is no additional change, the date = 999999. The second pointer is set to 0, but is not used. Later, on March 1, 1973, site

No. 8 at Argo High School (016006,141540001) change their method for SO_2 from 91 to 13:

Old Statement	New Statement
DATA NCHNGS/2/	DATA NCHNGS/4/
DATA M/99*91,-1,63*91,4*11,91, 2*13,....	DATA M/99*91,-1,63*91,4*11,-3, 2*13,....
DIMENSION CHNGES(5,2)	DIMENSION CHNGES(5,4)
DATA CHNGES/91,1,0,730101,2,77,1, 0,999999,0/	DATA CHNGES/91,1,0,730101,2,77,1, 0,999999,0,91,7,3,730301,4,13,7, 3,999999,0/

Again, NCHNGS agrees with the dimension of CHNGES, the second column (the SO_2 column) of M has a negative number to point to the third column in CHNGES where the information is stored. The third column points to the fourth column for information following March 1, 1973. The array CHNGES is completely filled even though the last pointer is not used.

Finally, suppose DePue site No. 1 changes its particulate sampling method again from 77 to 11 on July 4, 1973. The coding is as follows:

Old Statement	New Statement
DATA NCHNGS/4/	DATA NCHNGS/5/
DIMENSION CHNGES(5,4)	DIMENSION CHNGES(5,5)
DATA CHNGES/91,1,0,730101,2,77,1, 0,999999,0,91,7,3,730301,4,13,7, 3,999999,0/	DATA CHNGES/91,1,0,730101,2,77,1, 0,730704,5,91,7,3,730301,4,13,7,3, 999999,0,11,1,0,999999,0/

NCHNGS is now five (5) since only one additional column was needed. Since this same site-pollutant combination had already changed its method once, the M array needed no further change. CHNGES(4,2) had to be changed to the correct date (730704) and CHNGES(5,2) now points to the fifth column where the final data is placed.

Each pollutant-site combination is different so if the same site changes two different pollutant sampling methods, these have to appear separately and independently in CHNGES.

APPENDIX E

OPTIONAL OUTPUT FROM CONVERSION PROGRAM

In addition to the tape output, the CONVERSION program will provide output showing first an unconverted Illinois record and then the same record in SAROAD format. This is written to the diagnostic output file.

The MAIN routine controls this option through a variable called OPTION. If it is set to 0, no record-by-record account is placed in the diagnostic file and only unprocessable records appear there. If OPTION is set equal to anything but 0, the additional output is written. The variable DIAG in the MAIN routine specifies the unit number for the device where the optional output and the other diagnostic messages will be printed.

Samples of these printed output for record types 3, 2, 1, and 5 are illustrated in Table 4-4.